EVALUATING MACROECONOMIC AND DISTRIBUTIONAL IMPACTS OF ACTUAL AND ALTERNATIVE TAX REFORMS IN SPAIN: AN APPLIED GENERAL EQUILIBRIUM MODEL

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VERSION: 29TH APRIL 2016

Abstract

This paper carries out a quantitative assessment of actual and alternative tax reforms in the context of the Spanish economy. In doing so, we have used a static applied general equilibrium model. The tax reforms considered in our approach affect the structure of both the value-added tax and the personal income tax. With this objective we have constructed a novel data set that consists in a Microeconomic Spanish Social Accounting Matrix for the year 2010. This data set distinguishes between different households' categories according to their taxable income levels. Furthermore, for each household group, we have disaggregated total taxable income by major income sources i.e. labor income (salaries and wages, unemployment benefits and pensions), capital and property income. Our approach and the way we have built the Microeconomic Social Accounting Matrix enable us to offer two important contributions. First, changes in the degree of progressivity derived from the tax reform can be evaluated in a more comprehensive manner than previous analyses in this line in the context of the Spanish economy. Second, from our static comparative exercises we have extracted useful information not only in terms of the degree of effectiveness and efficiency reached by the tax reforms but also in terms of their potential distributive effects i.e. changes in welfare levels and the tax wedge that approximates fiscal pressure on labor income for each household category.

Keywords: redistribution, income inequality, tax reform, CGE.

JEL Classification: D63, E62, H22, H24, H30

1. INTRODUCTION

In order to meet the stability requirements of European authorities and recover the credibility of public accounts, several tax reforms were implemented in the Spanish economy since 2010 till 2016. These tax reforms affected both direct i.e. the personal income tax (PIT) and indirect taxes i.e. the value-added tax (VAT). The principal objective of the tax reform packages was to reduce the public deficit due to the fiscal consolidation pressures. Therefore, the derived potential distributional effects of these tax reforms constituted a 'secondary issue'.

Recent measures such as the tax reform of personal income taxes that came into force first in 2015 and then in 2016 have probably shifted the policy priorities. The deterioration of the income distribution as a result of the deep economic crisis experimented in the Spanish economy (2007-2014) may explain the change in the policy focus. Differently to other developed economies, especially during the 80s, Spain did not follow the trend of increasing income distribution disparities (OECD, 2011). Nevertheless, as a result of the virulence of the current economic crisis, Spain has been one of the countries where income inequalities have risen the most i.e. the Gini coefficient increased 4 percentage points from 2007-2011 (OECD, 2013). Covering a broader period of analysis (2007-2012) and using different income distribution indicators such as the S80/S20 ratio (Goerlich and Villar, 2009), alternative analyses show that the income of the wealthiest 20 percent of the population moved from 5,7 to 7,3 times higher (on average) than the income of the 20 percent least wealthy in the Spanish economy (BBVA-Ivie Institute, 2014).

All these stylized facts points out the urgent need for both monitoring and implementing appropriate and effective tax reforms in Spain particularly oriented to reduce income disparities. Improving income distribution constitutes a 'moral obligation' for all governments and institutions. Furthermore, this is very important in the context of the Spanish economy since greater income equality may increase GDP per capita up to 5 percentage points (Cingano, 2014). Consequently, having sound empirical estimates of the potential macroeconomic and distributional impacts of the current tax reforms and the alternative proposals is crucial for the present context of the Spanish economy.

Using a static CGE model, the present study evaluates the potential macroeconomic effects i.e. impacts on GDP, public deficit, price levels, labor and capital income and aggregate unemployment rate as well as the distributional effects i.e. Effective indicators (the distribution of changes in welfare levels and fiscal pressure within households groups) and Structural measures (at a particular household income level) of the degree of progressivity of the undertaken and proposed tax reforms in the Spanish economy.

Not without limitations, since the seminal work of Shoven and Whalley (1972, 1984) the Computational General Equilibrium (CGE) approach has been considered among the most adequate tools to evaluate potential impacts of fiscal policies in general and in particular, tax reforms. In distinguishing by different types of households, this approach presents the advantage of computing simultaneously the degree of efficiency (macroeconomic indicators) and distributional effects (microeconomic indicators) of potential tax reforms while controlling for the total impacts over the whole economic system (direct, indirect and induced effects). Therefore, this methodology enables analysts to consider not only the existing interdependencies between markets and economic agents but also the linkages between these two types of policy impacts.

Apart from CGE models, tax reforms can be evaluated through micro-simulation models (MSM) too. Each of them has certain advantages and disadvantages. The main advantages of CGE models are that they are strongly founded in microeconomic theory, take into account economic flows in a flexible manner, and incorporate explicitly price effects. Therefore, they

are appropriate tools to evaluate efficiency impacts of tax reforms i.e. impacts on aggregate welfare levels, public deficit and on GDP, among others. Nevertheless, CGE models very often include a single representative household, making it difficult to study effects on equality between different households' categories. MSM, instead, represent probably the best approach to calculate distributional issues regarding tax reforms. The main drawback of MSM is that they are partial equilibrium models and thus, they are not appropriate to evaluate efficiency impacts of public policies as those are usually economy-wide. As an attempt to approximate better the effects of tax reforms, more and more analysts have opted to link CGE and MSM.

As stated before, as a point of departure in our research, we have used the CGE model that contemplates different representative households groups. With the objective of fulfilling adequately the purposes of our analysis, we have constructed a novel data set that consists in a Social Accounting Matrix(SAM) for the period of 2010 for the Spanish economy. This data set includes nine types of households according to its particular taxable income level. Furthermore, disaggregated information about the contribution of each income source for each household category is also provided. In fact, this disaggregation constitutes an important contribution of our approach since it provides more comprehensive information on the degree of structural progressivity of each tax reform. To the best of our knowledge, this has not been addressed by previous analyses in this line (Álvarez-Martínez and Polo, 2014), not at least for the context of the Spanish economy.

Using the Spanish Microeconomic SAM for the year 2010 built by the authors, we have carried out three static comparative exercises with our CGE model. The first two exercises evaluate in a sequential manner the actual tax reforms undertaken by the Spanish government: the VAT Reform in force since July 2012 and the PIT Reforms implemented in two packages: one in 2015 and 2016. The third exercise consist in evaluating alternative tax reforms that has been proposed by emerging parties and that aim at increasing the degree of simplicity of the tax system while addressing the same objectives pursued by actual tax reforms: favor fiscal consolidation while improving income distribution.

In advancing results, our findings revealed that the VAT Reform of 2012 that increase remarkably VAT rates performed quite well in terms of effectiveness i.e. reducing public deficit. Nevertheless, this policy measure deteriorated GDP levels and turned out to be regressive in the sense that the fiscal wedge i.e. the ratio of total taxes charged on labor income (PIT and social security contributions) to gross labor income, especially increased for low taxable income groups. The derived welfare losses were also concentrated in poorest households. The subsequent tax reforms that contemplated tax cuts over PIT, though implied a recovery of income distribution equality, presented little impact in terms of economic growth.
The third exercise indicates that advocating for simplicity would have led to similar effects in terms of effectiveness and efficiency. In terms of distributional impacts, we cannot extract clear conclusions from our results.

The remaining of this working paper is organized as follows. Section 2 describes briefly the Spanish tax system that was present in 2010, before the tax reforms contemplated in this analysis. Section 3 presents the structure of the static CGE model used in this analysis. Section 4 shows in detail how the Microeconomic SAM for the Spanish economy has been constructed. Section 5 outlines the techniques followed to evaluate the tax reforms and the main findings. Section 6 concludes.

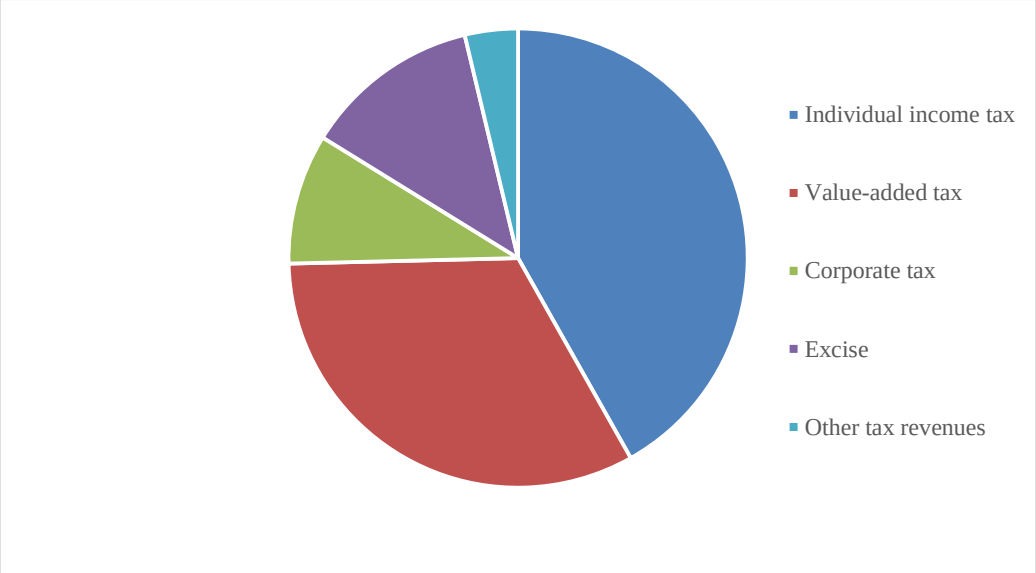
2.THE STRUCTURE OF THE SPANISH TAX SYSTEM IN 2010: AN OVERVIEW,

Here in this section, we make a brief description of the Spanish tax system, distinguishing the revenues collection from different types of taxes, the structure of direct and indirect taxes and the tax burden by household income levels in the case of personal income tax.

The Spanish tax system is basically composed of five tax categories: PIT, VAT, corporate tax (COT), social security contributions and excise taxes. These direct and indirect taxes represent

about 90 percent of total tax revenue. Therefore, they provide most of the resources of the Spanish public administrations. In 2006, the Spanish tax system opted for a late reform, adapted to a semi-dual model, valid until the time for such reform but still weak in terms of tax collection capacity and in a scenario of application that was about to change. Since this year, direct taxation has been gaining weight at the expense of indirect taxation, to be separated by 6 percentage points (percentage of total tax revenue). Nowadays, the main tax figures in terms of tax revenues in Spain are the PIT followed by VAT, generating both tax revenues of around two thirds of total revenue. Figure 1 shows in detail the participation of each tax in total revenue in 2010.

Figure 1. Distribution of the main tax figures on total revenue in Spain (2010)



Source: Own elaboration from Tax Collection Report, AEAT (2014)

In turn, following the tax structure, the basic magnitudes of the Spanish tax system have followed a similar evolution in general terms to the average European Union (EU) and the Organization for Economic Cooperation and Development (OECD) countries prior to the arrival of the current economic crisis (See Table 1).

Table 1. Average values of the basic fiscal magnitudes in 2010. OCDE and Spain

	OCDE countries	**Spain**
Overall Tax Burden	35	34
Personal Income Tax: Maximum marginal rate	40.33	39.6
Personal Income Tax: Number of Brackets	4.2	4
Corporate Tax: Average Tax Rate	33	35
Average Value-Aded Tax Rate	18	16

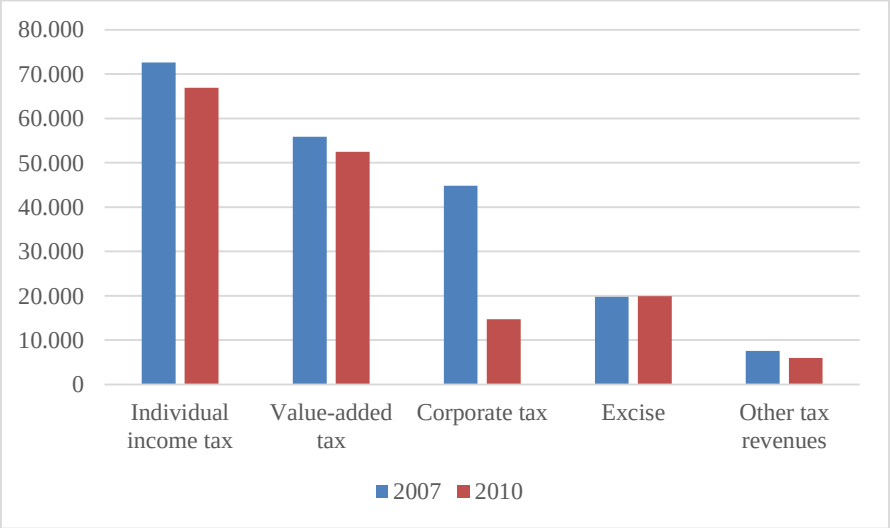
Source: Own elaboration from OECD (2010)

Since 2008, tax revenues in Spain have suffered a big drop in the wake of the economic crisis. Two reasons justified the decline in tax revenues, namely, the deteriorating fiscal situation in the country during this period and the process of fiscal consolidation. The total tax collection of the Spanish system at the beginning of the crisis was 200,676 million euros and, in 2010, it shrinks to 159,956. In particular, the fall in government revenue accounts for nearly 50 percent

of the increase in the deficit between 2007 and 2009. The fall in tax revenues has left perceived especially in those tax figures that strongly depend on the evolution of corporate profits, consumption levels and the housing market (Hernández de Cos y López Rodríguez. 2014). Subsequently, the reduction of public deficit in the 2009-2013 in two thirds was due to the increase in revenues, which rose 2,5 points relative to GDP in the same period.

Figure 2 shows the collection of the main taxes in 2007 and 2010. The first year reflects the previous tax year at the beginning of the crisis period in Spain, which marked the end of the long expansionary period of the Spanish economy (Ruiz -Huerta Carbonell and Garcia Diaz, 2012). As can be seen, the most significant drop in revenue occurred in the case of corporate tax (44,823 million euros in 2007 compared to 14,690 million euros collected in 2010), followed by the variation produced in VAT revenue (from 55,851 in 2007 to 52,446 million euros in 2010). This figure has undergone two changes to their tax rates during and after this period. First, from July 1, 2010, the general rate rose from 16 percent to 18 percent and the reduced rate rose from 7 percent to 8 percent, without having produced any alteration in relation to the type super-reduced 4 percent and the types of equivalence surcharge (Conesa et al, 2010). Then, from September 1, 2012, the general rate rose from 18 percent to 21 percent and the reduced rate of 8 percent to 10 percent, remaining super-reduced rate again at 4 percent.

Figure 2. Collection of the main taxes in Spain (2007 and 2010).Units: Million Euros.



Source: Own elaboration from Tax Collection Report, (AEAT 2007 and 2010)

According to the current Spanish tax system, there are mainly three taxes to consider: PIT, CT and VAT. Among them, the PIT is the most important one given its enormous collection power in this country. As opposed to standard tax systems that apply a progressive rate structure to a single measure of taxable income, this tax treats different income forms in a partially separate fashion. The different sources of income of the Spanish individual income tax are given by labor income (LI), total labor income (TLI), social insurance contributions (SIC), stock income (SI), rental income (RI), income from economic activities (EAI), capital gains and losses (CGAL), tax credits (TC) and tax liabilities (TL). Taxable income (TI) consists of the sum of gross income, income returns and allocations (or attributions) of income and is calculated as follows: LI + SI + RI + SEI (including other sources of income referring to the called income

allocation regime and rent imputations regime)[1]. These income concepts are then aggregated into two different tax bases, a savings tax base and a general tax base. Each tax base is taxed at different rates, following a semi-dual tax scheme. The tax system consists of a slightly progressive rate for 'savings tax base' (mainly for the stock income) along with a progressive rate for 'general tax base' levied on varying tax bases (ie, including the rest sources of income, with some exceptions). Additionally, the PIT in Spain is also supplemented by social security contributions and other labor market contributions.

Moreover, this is a 'shared' tax whose total collection is divided between the central government (50 percent) and the regional ones (50 percent). In turn, tax liabilities from 'general tax base' are divided into two different tax schedules: the national one and the regional one, according to their associated tax schedules (different marginal tax rates by brackets) but the two types of taxes are enforced and administered in an integrated national system. More specifically, there are different tax schedules at the regional level due to the regulatory powers transferred to the different regions (called Autonomous Communities) and they are complementary to the national one. By 2010, only the Community of Madrid, the Autonomous Community of La Rioja and the Community of Valencia have approved the corresponding differentiated regional scales. However, the differences among them are very small and regional tax schedules are hardly uniform across taxpayers.

Table 2a shows the different tax rates applied at a national and regional level in 2010 that relate to the 'general tax base', according to different taxable income brackets. The different tax rates applied to the 'general' tax shown in this table are cumulative such that a taxpayer in the top bracket is subject to the different marginal tax rates applied to each income bracket (along with the other flat tax for saving tax). On the other hand, according to the figures presented in Table 2b, a slightly progressive tax is applied to 'savings tax base', regardless the place of residence within the national territory.

Table 2a. Scheme of national and regional tax rates applied to the general tax base

Taxable income (until)	Tax liabilities	Taxable income (left)	National tax rate	Regional tax rate**	Total tax rate
0.00	0.00	17,707,20	12.00	12.00	24%
17,707.20	2,124.86	15,300,00	14.00	14.00	28%
33,007.20	4,266.86	20,400,00	18.50	18.50	37%
53,407.20	8,040.86	onwards	21.50	21.50	43%

*Values expressed in euros

** This is the regional tax schedule applied in the absence of the existence of a particular tax schedule applied by any region (those who have not exercised this regulatory power)

Table 2b. Scheme of national and regional tax rates applied to the savings tax base

Taxable income	National tax Rate	Regional tax Rate	Total tax Rate
Until 6,000 euros	9,5%	9,5%	19%
From 6,000 euros onwards	10,5%	10,5%	21%

Secondly, in terms of tax collection, we find the value-added tax. This is a national tax, homogeneous for the whole country, including three different brackets: the bottom tax (4

[1] The computation of taxable income consider labor income as the total of gross income (cash and in kind) in addition to employer contributions to pension plans and similar. They also include some income allocation and rent imputations that we do not consider in our decomposition analysis because given its insignificance in the percentage of total income. However, they must take into account to define taxable income.

percent), the middle tax (7 percent) and the top tax (16 percent) depending on the degree of urgent necessity for the society, ie, on their consideration as a necessary or a luxury good or service. Then, with application from July, 1st 2010, the Council of Ministers approved a generalized increase in VAT rates whose general tax rate raised from 16 to 18 percentage points and whose semi-reduced tax rate raised from 7 to 8 percentage points, while the super-reduced one, which applies to basic necessities, remained unchanged. Table 3 shows the tax base changes mentioned above applied to different good and services, depending on their consideration as necessary goods or luxury goods.

Table 3. Scheme of VAT tax rates in 2010

Taxable income	Bottom tax rate	Middle tax rate	Top tax rate
Before tax reform (until July 2010)	4%	7%	16%
After tax reform (from July 2010)	4%	8%	18%

Thirdly, we must take into account the corporate tax. This is also a national and homogenous tax that presents a fixed rate of 30 percent (although it may vary depending on the type of company concerned). Table 4 indicates these differences in relation to the tax rate for the main type of companies.

Table 4.Scheme of CT tax Rates in 2010

Type of Company	Tax rate	Comments
General	30%	
Small companies	25%	25% (taxable income until 120,202.41 €) 30% (rest of taxable income)

Notes: Small companies refers to those: a) whose turnover given in the immediately preceding tax period is less than 8 million euro or b) when the entity was newly created, the amount of turnover refers to the first period tax that effectively develop the activity. If the tax period immediately preceding having had a shorter duration than a year, or activity had been developed during a period also lower than a year, the net amount of the turnover to rise to one year.

3. DESCRIPTION OF THE STATIC COMPUTATIONAL GENERAL EQUILIBRIUM MODEL FOR THE SPANISH ECONOMY.

The Computational General Equilibrium Model for the Spanish economy designed for carrying out the present analysis contemplates N=40 industries/products, three types of inputs, namely, capital, labor and intermediate production, nine categories of households classified according to their taxable income levels, a government sector, an account for corporations i.e. financial and non-financial corporation, two foreign sectors i.e. The European Union and The Rest of the World, a capital (savings/investment) account and a transfers account. The transfers account includes property income, welfare benefits and other transfers. Agents behave rationally i.e. they are profit and utility maximisers. None of the agents has significant market power. Under all these general conditions, agents' behavior is described as follows.

Related to production, a representative firm of each industry or sector minimizes costs subject to technological constraints based upon constant returns to scale thus the N markets for commodities are perfectly competitive. We follow the traditional Armington's assumption (Armington, 1969) whereby imported and domestic commodities are imperfect substitutes.

Consumption activities refer to those of a representative household for each households' taxable income category. For all categories, this representative household demands commodities and

savings under an income constraint. Households' income resources stem from selling labor and capital endowments at market factor prices plus transfers.

The government produces a public consumption commodity and supports public investment. These government expenditures activities are financed through the collected taxes, the income that generates its capital endowment and, if necessary, the public deficit. Taxes are of two general types: Direct taxes and Indirect Taxes. Direct taxes include personal income taxes, property income taxes, corporate taxes and social security contributions paid by households. The indirect taxes considered in our model refer to value-added taxes, taxes on imported production i.e. tariffs, social security contributions paid by employers and the remaining net taxes on products and production.

The corporations' sector that includes both financial and non-financial corporations, acts as an intermediary sector that contributes to the economy selling its capital endowment, making transactions to the rest of the economy in terms of property income and other transfers and paying direct taxes i.e. corporate taxes.

In equilibrium all markets clear with the exception of the labor market. All labor force is assumed to be owned by households, at an aggregate level. Labor in this economy is demanded by both, the domestic industries and the two foreign sectors. Although the total supply of labor is fixed, this supply conforms two parts: one related to 'employed' labor and another that is idle and interpreted as involuntary unemployment. The unemployment is made endogenous using a wage curve that 'connects' unemployment to the level of the real wage rate in the economy. Changes in unemployed labor are homogenously distributed among the nine households' categories considered in our analysis.

This is the general description of the model. In the following subsections we present details about agents' behavioral assumptions, the production structure, the closure rule, equilibrium conditions and how the model is calibrated.

3.1.The Production Side:

Each of the N industries/products in the economy produces and homogenous commodity which is used to satisfy intermediate demand, final domestic demand (private and public consumption and gross capital formation) and foreign demands (exports to European Union and the Rest of the World). Following the aforementioned general assumptions of the model, all production takes place under constant returns to scale nested technologies. This nested production structure comprises three stages.

In the first stage, the production of final output reflects a partial degree of substitution between domestic and imported commodities. Therefore, for a set of industries $T \subset N$ total output is a composite between domestic production X_t^{D}, imported production from the European Union $X_t^{M_{EU}}$ and commodities coming from the rest of the world $X_t^{M_{RW}}$ obtained throughout a constant elasticity of substitution (CES) technology:

$$X_t = \left[\left(\alpha_t^{D} X_t^{D}\right)^{\rho_t} + \left(\alpha_t^{UE} X_t^{M_{EU}}\right)^{\rho_t} + \left(\alpha_t^{RW} X_t^{M_{RW}}\right)^{\rho_t}\right]^{1/\rho_t} \quad t \in T \subset N \qquad (1)$$

Where ρ_t is a parameter that determines the Armington's elasticity in each industry t $\sigma_t = 1/(1-\rho_t)$ and with benchmark data on total costs on domestic and imported production, the CES Armington function parameters α_t^{D}, α_t^{UE} and α_t^{RW} too. To the best of our knowledge, there are no available specific estimates for the Armington substitution elasticities for Spain. We take average elasticities from the GTAP8 project (Narayanan et al. 2012) as our initial values.

In the second stage, domestic production is given by a Leontief function that combines intermediates inputs X_{ij} and a composite of value-added VA_j in fixed proportions per unit of output i.e. a_{ij} and v_j :

$$X_j^{\mathrm{D}} = \mathrm{Min}\left[\frac{X_{ij}}{a_{ij}}, \frac{VA_j}{v_j}\right] \qquad j=1,\ldots,\mathrm{N} \tag{2}$$

Lastly, in the third stage, the value-added composite is a constant returns to scale Cobb-Douglas technology i.e. $\alpha_i^L + \alpha_i^K = 1\ \forall i$:

$$VA_i = \left[L_i^{\alpha_i^L} K_i^{\alpha_i^K}\right] \qquad i=1,\ldots,\mathrm{N} \tag{3}$$

3.2.Households' Behavior.

Households indexed by levels of taxable income d=1,….9 receive income directly from productive factors and receive transfers from other institutions (the rest of the world and the government). In each household category *d*, the representative household uses their income to pay direct taxes, spend on consumption or saving activities and undertake transfers to other institutions.

Consumption C_i and Saving S_{H} activities of the representative household in each category *d* are characterized using a Cobb-Douglas utility function:

$$U_d\left(C_{di}, S_d^{\mathrm{H}}\right) = \left[\prod_{i=1}^{\mathrm{N}} C_{di}^{\beta_{di}}\right] S_d^{H\left(1-\sum_i^{\mathrm{N}} \beta_{di}\right)} \quad \forall d = 1,\ldots,9 \tag{4}$$

Under this behavioral assumption both consumption and saving activities represent constant shares β_{di} and $1 - \sum_i^{\mathrm{N}} \beta_{di}$over net disposable income $\mathrm{M}_d^{\mathrm{N}}$

Total household's income (gross income) in each category comes from rents generated from his capital endowment $r\bar{K}_d^{\mathrm{H}}$, the transfers received $\mathrm{TR}_d^{\mathrm{R}}$ corrected by a Laspeyres consumer price index CPI, unemployment benefits $wb_d^u \bar{L}_d u$ and labor income that is supplied to domestic industries and to the two foreign sectors, in this case, in fixed proportions since in our approach, foreign labor markets are not reflected:

$$\mathrm{M}_d^{\mathrm{G}} = r\bar{K}_d^{\mathrm{H}} + w(1-u_d)\bar{L}_d + wb_d^u \bar{L}_d u_d + \mathrm{CPI}\left(\mathrm{TR}_d^{\mathrm{R}}\right)\ \forall d = 1,\ldots,9 \tag{5}$$

Net disposable income devoted to both consumption and savings activities corresponds to the gross disposable income minus personal income taxes once social security contribution paid by households are deducted $\mathrm{TD}_d^{\mathrm{H}}\mathrm{M}_d^{\mathrm{GN}}$;social security contributions paid by employed households $\mathrm{SSH}_d^{\mathrm{E}}(1-u_d)\bar{L}_d$, social security contributions paid by unemployed labor $\mathrm{SSH}_d^{\mathrm{U}} wb_d \bar{L}_d u_d$ and 'indexed' transfers that household made to the economy $\mathrm{CPI}\left(\mathrm{TR}_d^{\mathrm{P}}\right)$:

$$\mathrm{M}_d^{\mathrm{N}} = \mathrm{M}_d^{\mathrm{G}} - \mathrm{TD}_d^{\mathrm{H}}\mathrm{M}_d^{\mathrm{GN}} - \mathrm{SSH}_d^{\mathrm{E}}(1-u_d)\bar{L}_d - \mathrm{SSH}_d^{\mathrm{U}} wb_d \bar{L}_d u_d - \mathrm{CPI}\left(\mathrm{TR}_d^{\mathrm{P}}\right)\ \forall d = 1,\ldots,9 \tag{6}$$

Notice that, in our model, we assume that the price of labor supplied at a national level (supplied domestically and abroad) is determined in the domestic economy, i.e. the net rental price of labor paid by domestic and foreign industries is the same. Furthermore, the unemployment benefits received by unemployed labor for each household category are computed as a proportion b_d of the rental price of labor. In other words, the unemployment subsidy is a 'margin' over net wages.

3.3.Financial and Non-Financial Corporations.

The account for corporations is quite commonly present in many Social Accounting Matrices (SAM's). It reflects the empirical reality that business surplus is not always fully distributed in first instance to asset holders as capital income. Part of it is assigned as property income. This account aims at avoiding 'leakages' in the SAM and thus allows the circular flow of income to be fulfilled. Therefore, the Corporations' behavior does not follow the standard rationality assumptions of economic agents and is seen in our model as a budget constraint:

$$(1-\mathrm{TD_C})\left(r\bar{K}_\mathrm{C}+\mathrm{CPI}\left(\mathrm{TR}_\mathrm{C}^\mathrm{R}\right)\right)-\mathrm{CPI}\left(\mathrm{TR}_\mathrm{C}^\mathrm{P}\right)=\mathrm{P_I}S_\mathrm{C} \quad (7)$$

Where $\mathrm{TD_C}$ is the corporate income tax rate, $r\bar{K}_\mathrm{C}$ is the value of fixed capital services endowment owned by corporations, $\mathrm{CPI}\left(\mathrm{TR}_\mathrm{C}^\mathrm{R}\right)$ and $\mathrm{CPI}\left(\mathrm{TR}_\mathrm{C}^\mathrm{P}\right)$ are respectively the indexed transfers received and paid by corporations and $\mathrm{P_I}S_\mathrm{C}$ refers to the Non-distributed business surplus or, alternatively, the contribution of corporations to economy's gross capital formation.

3.4.Government

The government collects a fixed proportion of the taxes from consumption, production and income generation e.g. a significant part of the tariffs is collected by the European Union. This tax revenue together $\mathrm{RT_G}$with the income generated from capital endowments $r\bar{K}_\mathrm{G}$ and indexed received transfers $\mathrm{CPI}\left(\mathrm{TR}_\mathrm{G}^\mathrm{R}\right)$ allow the public sector to pay the value of commodities for public consumption in fixed proportions$\bar{C}_i^G$, pay unemployment benefits$\sum_{d=1}^{9} wb_d\bar{L}_d u_d$ undertake other transfer operations to the economy $\mathrm{CPI}\left(\mathrm{TR}_\mathrm{G}^\mathrm{p}\right)$ and finance the value of his investment activities $\mathrm{P_I}S_\mathrm{G}$:

$$\mathrm{RT_G}+\ r\bar{K}_\mathrm{G}+\mathrm{CPI}(\mathrm{TR}_\mathrm{G}^\mathrm{R})-\sum_{i=1}^{\mathrm{N}}\bar{C}_i^G p_i-\sum_{d=1}^{9} wb_d\bar{L}_d u_d-\mathrm{CPI}\left(\mathrm{TR}_\mathrm{G}^\mathrm{p}\right)=\mathrm{P_I}S_\mathrm{G} \quad (8)$$

3.5. Involuntary Unemployment: A Wage Curve

In 'flexible' classical labor markets i.e. no rigidities are present, real wages are given by the marginal productivity. Nevertheless, if our model we relaxed this condition introducing a wage curve (Oswald, 1982; Blanchflower and Oswald, 1994, 2005) that considers a negative relationship between unemployment rates and real wages[2] :

$$\frac{w}{\mathrm{CPI}}=\mu(1-u)^{\frac{1}{\gamma}} \quad (9)$$

[2] One of the plausible 'stories' behind the wage curve is the following. High unemployment rates will decrease the unions' members. Workers dismissed may face difficulties to find another job. Consequently, high unemployment rates may move unions' preferences towards a greater concern with keeping the number of jobs and not higher wages.

Where μ refers to a constant and γ is a non-negative parameter the sensitivity of the real wage to the unemployment rate i.e. the larger (smaller) is γ , the weaker (stronger) will be the reaction of the real wage to the unemployment rate. According to the expression in (9), the elasticity ε of the real wage with respect to unemployment is given by:

$$\varepsilon = \frac{d(w/\mathrm{CPI})}{du}\frac{u}{w/\mathrm{CPI}} = -\frac{1}{\mu}\frac{u}{(1-u)} \tag{10}$$

With the objective of reducing the number of calibrated parameters of our CGE approach, the trade-off between unemployment and the real wage can also be alternatively expressed as a relative difference from the benchmark wage curve equilibrium equation in the following manner:

$$\frac{w/CPI}{w_0/CPI_0} = \left[\frac{1-u}{1-u_0}\right]^{\frac{1}{\gamma}} \tag{11}$$

The existence of a wage curve in the Spanish economy has been tested and proved by a wide range of analyses (Canziani, 1997; Bajo et al.1999, Jimeno-Bentolila, 1998; Sanromá and Ramos, 2005; García-Mainar and Montuenga-Gómez, 2003). Most of these studies found a significant value ε close to -0.15. In this line, more recent empirical works have reported a central value for ε of -0.36 (De la Roca, 2014; Font et al. 2015). Therefore, this is the reference value chosen to compute γ in (11).

3.6.Foreign Sector(s) and the Saving-Investment balance

Macroeconomic consistency rules establish that the current account balance mirrors the saving and investment behavior of an economy. Consequently, the current account balance is a component of total savings:

$$\mathrm{P_I}S_{\mathrm{X}} = \mathrm{P_X^{UE}}\left[\sum_{t=1}^{\mathrm{T}} X_t^{\mathrm{M_{UE}}} - \sum_{i=1}^{\mathrm{N}} \bar{E}_i^{\mathrm{UE}}\right] + \mathrm{P_X^{RW}}\left[\sum_{t=1}^{\mathrm{T}} X_t^{\mathrm{M_{RW}}} - \sum_{i=1}^{\mathrm{N}} \bar{E}_i^{\mathrm{RW}}\right] + w\left[\bar{L}_{\mathrm{X}}^{\mathrm{N}}\right]$$
$$+\mathrm{RT_X^N} + \mathrm{CPI}\left(\mathrm{TR_X^R} - \mathrm{TR_X^P}\right) \tag{12}$$

As indicated in expression (12), the value of foreign sector's savings corresponds to the difference between the value of total imports $\mathrm{P_X^{UE}}\sum_{t=1}^{\mathrm{T}} X_t^{\mathrm{M_{UE}}} + \mathrm{P_X^{RW}}\sum_{t=1}^{\mathrm{T}} X_t^{\mathrm{M_{RW}}}$ and total exports $\mathrm{P_X^{UE}}\sum_{i=1}^{\mathrm{N}} \bar{E}_i^{\mathrm{UE}} + \mathrm{P_X^{RW}}\sum_{i=1}^{\mathrm{N}} \bar{E}_i^{\mathrm{RW}}$ plus the value of net primary income that stems from foreign labor demand and supply, the net taxes collected by the foreign sectors and the deflated net transfers to the foreign sectors. Exports in our model are not price sensitive. The prices of the trade balances of the two foreign sectors considered in our analysis i.e. $\mathrm{P_X^{UE}}$ and $\mathrm{P_X^{RW}}$ are computed as prices indexes that refer to a weighted average of exports valued at final gross domestic prices:

$$\mathrm{P_X^{UE}} = \sum_{i=1}^{\mathrm{N}} \overline{cE}_i^{\mathrm{UE}} p_i \tag{13a}$$

$$\mathrm{P_X^{RW}} = \sum_{i=1}^{\mathrm{N}} \overline{cE}_i^{\mathrm{RW}} p_i \tag{13b}$$

With $\overline{cE}_i^{\mathrm{UE}}$ and $\overline{cE}_i^{\mathrm{RW}}$ being he commodity share over total exports to the European Union and the rest of the world respectively.

The last macroeconomic closure rule considered in our CGE approach (Dewatripont and Michel 1987) refers to the balance between investment and savings. In line with previous analysis that have also attempt to analysis the impact of changes in fiscal policies using the CGE methodology (Kehoe et al. 1988; Manresa and Sancho, 2005, Sancho 2010), in our model we make use of the savings-driven closure in the sense that investment is endogenously determined by all economic agents' savings:

$$S_{\mathrm{G}} + S_{\mathrm{H}} + S_{\mathrm{C}} + S_{\mathrm{X}} = \mathrm{I} \qquad (14)$$

As usually done in CGE models, a Leontief technology with fixed coefficients $\overline{cI}_i$ describes the allocation of total investment to sectoral final demand. Therefore, as in the case of the trade balances, its price $\mathrm{P_I}$ is a weighted average of commodities gross final domestic prices:

$$\mathrm{P_I} = \sum_{i=1}^{\mathrm{N}} \overline{cI}_i p_i \qquad (15)$$

3.7.Equilibrium conditions

With the exception of the labor market, the equilibrium concept in our model is essentially Walrasian. This equilibrium is described by a vector of prices for the N commodities and primary production factors (p_i^*, w^*, r^*), a vector of total production outputs X_i^*, a level of gross capital formation I^*, an unemployment rate u^* and a level of tax revenues RT^* that satisfy the following equilibrium conditions: a) Market for commodities clear in the sense that for a given commodity, the quantity supplied must be equal to the sum of the quantities demanded inside and outside de economy i.e. exports b) The market for capital clears. The capital demanded in the economy must exhaust the aggregate supply of capital endowed to the economic agents. The case of labor is an exception in our approach since labor demanded by production units must equal total labor supply that is being used and may not correspond to total labor endowment c) Total tax revenues coincide with total tax payments d) Total investment equals savings by all agents and e) Final prices satisfy the average cost rule i.e. in equilibrium producers make zero profits.

Because the corollary of Walras' Law i.e. only relative prices can be determined, we need to choose a numeraire to solve the system. The selected price is capital's net rental price.

4. THE COMPILATION OF A SOCIAL ACCOUNTING MATRIX DISAGGREGATED BY HOUSEHOLDS' CATEGORIES FOR SPAIN 2010

For calibrating the ACGE model described in Section 3, we have used real data on the Spanish economy. Our data set consists in a SAM that relates to the year 2010 (SAM-SPAIN2010) elaborated by the authors. This matrix includes 40 commodities, 9 representative households classified according to their taxable income levels, the remaining institutional units contemplated under the ESA-2010 i.e. financial and non-financial corporations, public administration, non-profit institutions serving households (NPISH), two foreign sector i.e. the European Union and the Rest of the World and detail information about all kind of transactions referring to both primary and secondary distribution of income. For the sake of analytical

simplicity, the accounts of financial and non-financial have been aggregated into a single account. The same procedure has been done with the public administration and the NPISH. Detail disaggregated information about the different types of both direct and indirect taxes is also provided by the data set. Summing up, the SAM-SPAIN2010 encompasses 64 accounts. The following sections describe step by step how this data set has been constructed, starting from the methodology used to build the Symmetric Input-Output Table at purchases' prices and ending by the full description of how the account of households has been disaggregated. In other words, we present here all the methodological approaches followed and data sources used to transform the Macroeconomic SAM into a Microeconomic SAM, the latter distinguishing among different households' categories.

4.1. Constructing a Symmetric Input-Output Table at Purchases' Prices for the Spanish Economy 2010.

4.1.1.Reconciling the Flows of SUTs

In compiling the SAM-SPAIN2010, we have first built a Symmetric Input-Output Table (SIOT) for the Spanish economy at basic prices. When the authors started to construct the data set, only the Supply and Use Tables (SUTs) for the year 2010 were available. The Supply Table, also known as Make Table, contains the supply of commodities (products), both domestically produced and imported by type of industry. The Use Table shows, instead, how production is allocated among its two possible 'purposes': industries' intermediate use or final use i.e private consumption expenditures, public administration consumption expenditures, gross capital formation and exports. In addition, the Use Table includes information about the structure of industries' value added at basic prices: other net taxes on production, compensation of employees and gross operating surplus and mixed income.

Nevertheless, due to the presence of secondary production, some assumptions or hypothesis must be used to redistribute this production in order to obtain a square matrix i.e. the SIOT either product-by-product or industry-by-industry. In other words, were secondary production not observed, the transformation of SUTs would be unnecessary.

There are four traditional approaches or models to transform the SUTs into a SIOT. The first two approaches allow obtaining product-by-product SIOTs. Their hypotheses relate to costs' structures or technology: the product technology assumption (Model A) and the industry technology assumption (Model B). The two remaining approaches, instead, makes possible to construct industry-by-industry SIOTs. While assuming that the level of the product output adjusts to the industry output, these two types of models (Model C and Model D) rest on the hypothesis that the structure of sales remain unaltered. According to Model C, the industries' sales are independent of the structure of product sales. On the contrary, under Model D, the products' sales are independent of the structure of industries' deliveries. The question that may arise is the following: which of the aforementioned models is the most suitable to construct a SIOT?. Neither the United Nations Manual nor the European System of Accounts are completely clear on this point.

From an pure empirical point of view, as stated by the European System of Accounts 2010 (ESA-2010, Chapter 9), the choice of model depends on the national or regional economic activities' degree of specialization i.e. the relevance of 'secondary production', the homogeneity of products' production technology and data availability. For instance, if the purpose of the research is to quantify and explore the potential input-output multipliers in terms of emissions levels derived from potential changes in final

demand, some authors highly recommend the use of industry-by-industry approaches. This recommendation follows from the fact that most of the Input-Output Satellite Accounts are constructed on an industry-by-industry base, i.e. Tourism Satellite Accounts and Emissions Satellite Accounts, among others. On a theoretical basis, it has been proved that Model A presents superior axiomatic properties than Model B (Jansen and ten Raa, 1990). In considering the context of our analysis, however, the Eurostat Manual of Supply, Use and Input-Output Tables (Eurostat, 2008, Chapter 11, p.301) stipulates that industry-by-industry SIOTs are well suited for those analytical purposes related to industries such as the evaluation of tax reforms, impact analysis and fiscal policies among others. Product-by-product SIOTs, instead, are well suited for many other research analyses more connected to homogenous production units i.e. productivity and cost structure analyses, energy and environmental analyses. Lastly, from a theoretical perspective, Eurostat (Eurostat, 2008, Chapter 11, p. 301) advises Member Estates to report product-by-product SIOTs because they are more homogenous in their description of the transactions than industry-by-industry tables, since a single element of the latter can refer to products that are characteristic in other industries. Nevertheless, industry-by-industry SIOTs are also accepted by Eurostat provided that industry-by-industry tables are a good approximation of product-by-product input-output tables.

In sum, living aside the general purposes of our analysis i.e. evaluate the potential total impacts of fiscal tax reforms, we have opted for following the recommendations of Eurostat (Eurostat, 2008) from a theoretical point of view. Consequently, we have constructed a product-by-product SIOT for the Spanish economy for the period 2010. Among the two available models (Model A and Model B), we have chosen Model B to avoid the presence of 'negatives'. In line with the advised procedure also reflected in the Eurostat Manual of Supply, Use and Input-Output Tables (Eurostat, 2008), in constructing the SIOT-2010 for the Spanish economy, we have used the information contained in the Spanish SUTs both valued at basic prices.

In formal terms, according to the hypotheses of Model B and using the information contained into the Use Table U and the Make Table V at basic prices, the product-by-product intermediate demand matrix Z^B and the product-by-value added components VA^B have been estimated as follows:

$$Z^B = \left[U \cdot \left[diag[V \cdot e]\right]^{-1} \cdot V\right] \quad (16)$$

$$VA^B = \left[VA \cdot \left[diag[V \cdot e]\right]^{-1} \cdot V\right] \quad (17)$$

In (16) and (17) *e* refers to a column vector of ones and the expression *diag* denotes the diagonalization of the matrix.

Consequently, the balance between product *j* uses and product *j* resources Y_j with *j,i*=1…N at basic prices in our constructed Spanish SIOT for 2010 is given by has been obtained in the following way:

$$Y_j = \sum_{i=1}^{M} Z_{ji}^B + \sum_{c=1}^{C} F_{jc} \quad (18)$$

$$Y_j^T = \sum_{j=1}^{M} Z_{ji}^B + \sum_{s=1}^{S} VA_{sj}^B \quad (19)$$

Where F_{jc} relates to the final demand components by type of use *c* of product *j* i.e. *c*=private final consumption, public final consumption, gross capital formation and net exports, while *s* relates to the value-added components of the *j* product i.e. *s*= other net taxes on production, compensation of employees and gross operating surplus and mixed income

4.1.2.Changing the Valuation of the SIOT from Basic Prices to Purchases' Prices.

Since the main purpose of the analysis is to compute potential effects of specific fiscal tax reforms in the context of the Spanish economy, first the SAM must be valued at market or purchases' prices and second, detail information on both direct and indirect taxes is required to calibrate the initial equilibrium tax levels and evaluate consistently the total impacts of the fiscal tax reforms contemplated in this work (Collado and Sancho, 2002). Therefore, because the SIOTs constitute the 'core' of SAMs, the first step is to transform the initial Spanish SIOT valued at basic prices into purchases' prices. With this purpose, we have closely followed the methodology proposed by Lucena and Serrano (2006). These authors suggest using the additional information on net taxes on products included in the Make Table in order to calibrate tax margins. Then, the estimated tax margins are used to convert the transactions of the SIOT from basic prices to market or purchases' prices excluding, in this case, the trade and transport margins. Lastly and in marked contrast to the approach of Lucena and Serrano (2006), we have seen more appropriate to 'redistribute' the trade and transport margins throughout the transformed SIOT using the Cross-Entropy Method in order to balance the differences between product uses and product resources both valued at market or purchases' prices.

Once the SIOT at purchases' prices is estimated, the second step consists in splitting up the row vector of net taxes on products into three components: a) net value added tax i.e. the difference between total invoiced value-added tax and total deductible valued-added tax, b) net taxes on imports and c) other net taxes on production and products. In order to estimate the first component, the net value added tax per product group, we have employed the statistical data published within the Annual Statistical Report of the Value-Added Tax 2010 for Spain (General Department of Taxation of the Spanish Government, 2012, Statistical Annex III). This statistical report contains the distribution of total net value added tax among 63 economic activities. This level of disaggregation was found to be quite compatible with the 2008 European Classification of Products by Activity (CPA-2008). With regard to the second component, taxes minus subsidies on imports i.e. net import taxes, we have employed the World Trade Organization Statistical Database on Trade and Tariffs (WTO, 2016) to calibrate net tariff margins and consequently, total net tariffs per product category that correspond to the Spanish economy. Nevertheless, since specific data for Spain was not available, in order to approximate average tariff margins, we have used data on duty collection and import flows for each product (primary sector products and manufacturing products) that corresponds to the European Union for 2010 i.e. Spain is part of the European Customs Union and thus net tariff margins must be the same. Both Net value-added taxes and net imports taxes per products have been adjusted to make the total net value- added tax and the total net import tax flows consistent with the official figures reported by the Spanish National Institute of Statistics. Lastly, the third component has been obtained as 'a residual', once the estimated net valued-added tax and net imports arranged by product category are both extracted from net taxes on products.

Table 5: Estimated Components of Net Taxes on Products by Products' Group Category CPA-2008. Product Breakdown of the SAM-SPAIN2010. Units: Millions of Euros 2010.				
CPA-2008	**Products' group Description**	**Other Net-Taxes on Products.**	**Net Taxes on Imports**	**Net Value Added Tax**
01-03	**Agriculture, Hunting, Forestry and Fishing Products**	-6.216,531	54,228	743,590
05-09	**Mining and Quarrying Products**	-514,097	166,494	30,542
10-12	**Food, Beverages and Tobacco Products**	15.040,883	121,163	63,120
13-15	**Textile, Leather and Footwear Products**	4.247,696	164,300	376,773
16-18	**Wood, Cork, Pulp, Paper Products, Printing and Publishing**	102,016	8,923	546,217
19	**Coke, Refined Petroleum and Nuclear Fuel**	12.991,821	38,318	3.421,857
20-21	**Chemical and Pharmaceutical Products**	2.188,789	66,152	150,114
22	**Rubber and Plastic Products**	-126,678	25,659	357,507
23	**Other Non-Metallic Mineral Products**	-305,881	5,251	537,748
24	**Basic Metals and Fabricated Metal Products**	6,814	21,072	0,153
25	**Metallic Products not including Machinery and Equipment**	-839,554	6,110	1.145,705
26-27	**Electrical and Optical Equipment**	1.185,955	70,606	930,166
28	**Transport Equipment**	-82,436	23,988	330,614
29	**Motor Vehicles and Trailers**	2.494,218	41,922	296,350
30	**Other Transport Equipment, Nec**	116,754	11,153	0,012
31-32	**Furniture and other manufacturing products, nec**	2.120,708	9,987	64,132
33	**Repair and Instalation activities**	-893,385	0,000	1.054,679
35	**Electricity and Gas**	2.542,619	0,000	2.579,096
36	**Water Supply**	188,077	0,000	0,012
37-39	**Sewerage, Waste management and remediation services**	-25,073	0,000	20,105
41-43	**Construction**	3.608,485	0,000	7.088,862
45-47	**Wholesale Trade and Retail Trade**	-8.415,274	0,000	10.078,348
49-51	**Transport Services and Storage Services**	-1.803,283	0,000	39,776
52	**Post Services**	-727,900	0,000	366,533
55-56	**Accommodation and Food Services**	3.895,914	0,000	1.448,025
58-60	**Publishing, motion picture, video and television programme production services**	305,196	0,000	186,059
61-65	**Other Information and Communication Services**	-1.787,286	0,000	5.321,320
66	**Financial and Insurance Services**	1.301,722	0,000	2.000,231
68	**Real Estate Activities**	666,926	0,000	6.555,848
69-75	**Professional,Scientific and Technical Services**	2.685,098	0,000	7.096,361
77	**Renting of Machinery and Equipment**	-1.531,848	0,000	2.017,557
78	**Employment related Services**	23,881	0,000	0,012
79	**Travel Agencies' activities and related activities**	115,754	0,000	344,076
80-82	**Security, Research, Administrative and Business Activities**	589,973	0,000	534,386
84	**Public Admin and Defence; Compulsory Social Security**	-1.348,305	0,000	1.485,628
85	**Education activities**	-15,553	0,000	75,380
86	**Health activities**	-158,460	0,000	94,646
87-88	**Social Work activities**	-31,637	0,000	370,179
90-96	**Other Community, Social and Personal Services**	1.902,593	0,000	627,868
97-99	**Other services, nec**	412,234	0,000	433,146
Spanish National Accounts 2010 Total		***33.910,944***	***835,326***	***58.812,730***

Table 5 shows the estimated values for these there components of net taxes on products for 40 different products/industries and their corresponding CPA-2008 code. This level of aggregation constitute the product/industry breakdown used in our analysis.

4.2. Building the SAM-SPAIN2010

A SAM is a tabular representation of the whole set of both primary and secondary income distribution transactions of an economy in a given moment in time. The aim of constructing a SAM is to have an integrated system of accounts that connects production, expenditure, trade and investment activities in a consistent, closed form i.e. for each institution or decision unit (economic agents) income sources must equal income uses. Consistency refers to both microeconomic and macroeconomic consistency. Each agent's income-expenditure flows satisfy budget constraint-microeconomic consistency- and all agent's flows or transactions put together satisfy the standard macroeconomic identities. This dual consistency is very relevant for economic analysis modeling since it allows researchers to link actual data with an operational theoretical model i.e. SAM models (Stone and Brown, 1962; Pyatt, 1988) and AGEM (Shoven and Whalley, 1972,1984).

4.2.1. The Construction of the Macroeconomic SAM-SPAIN2010.

In building a SAM-Spain2010 we need to add information regarding the income sources and income uses of the different decision units (agents) contemplated under the ESA-2010: **Households, Financial and non Financial Institutions, the NPISH, Public Administration, the European Union and The Rest of the World**. All these transactions were extracted from the Integrated Annual Accounts of Institutional Sectors compiled by the Spanish Institute of Statistics[3]**.** Agents' transactions are disaggregated in the following accounts: **final consumption, savings, exports, imports, labor income, gross operating surplus and mixed income transactions, property income, unemployment benefits, other transfers (welfare benefits and other current transfers), social contributions paid by households (employees, self-employees, unemployed), social contributions paid by employers, personal income taxes, property income taxes, corporate taxes, other net taxes on production, value-added tax, net import taxes and other net taxes on products.**

Following the approach of Álvarez and Polo (2014), additional information obtained from complementary National Account tables i.e. National Accounts Detail Results was also used in order to a) disaggregate the European Union transactions from the Rest of the World's transactions, b) to treat properly the purchases by residents out of the economic territory and purchases by non-residents in the territory, c) to disaggregate social contributions payments by type and institution and d) incorporate Unemployment benefits. In the following subsections, we explained in detail how all this information has been assembled to the SAM-Spain2010.

[3] The data extracted from the Integrated Annual Accounts corresponds to the last update: October 22nd 2015.

Table 6: Transactions (Income Sources and Resources) of the Foreign Sector and Subsector. Spain 2010.Units: Millions of Euros 2010.				
	European Union		**Rest of the World**	
	Sources	**Resources**	**Sources**	**Resources**
Gross Labour Income	165,411	789,653	162,589	397,347
Social Contributions Employers	129,029	43,199	126,971	21,801
Gross Operating Surplus	0,000	0,000	0,000	0,000
Mixed Income	0,000	0,000	0,000	0,000
Rentas de la Propiedad	52.804,684	23.631,630	12.969,316	21.634,370
Direct Taxes	1.351,643	1.578,449	361,357	567,551
Social Contributions Employees	73,576	0,000	36,424	0,000
Welfare Benefits	369,750	2.012,955	140,250	364,045
Other current Transfers	12.603,555	5.596,957	10.573,445	2.863,043
Value-Added Tax	354,730	0,000	0,000	0,000
Other Net Taxes on Products (excluding Value-Added Tax and net taxes on imports)	-315,056	0,000	0,000	0,000
Other Net Taxes on Production	-5.238,000	0,000	0,000	0,000
Net taxes on imports	704,326	0,000	0,000	0,000
Gross Disposable Income	29.350,806	0,000	-1.477,806	0,000
Exports	0,000	187.949,900	0,000	87.897,100
Imports	168.503,968	0,000	121.449,032	0,000
Savings	**9.904,874**	0,000	**32.074,126**	0,000

A) Disaggregation of the European Union transactions from the Rest of the World's transactions.

In order to apply in a sound way the Armington assumption (1969) (See Section 3.1.) and taking into account that Spain is part of the European Customs Union, it is necessary to differentiate between two types of external sectors within the SAM: The European Union sector and the Rest of the World. With this purpose and because under the Integrated Annual Accounts of Institutional Sectors only a 'single' external sector is contemplated, we have used the *Foreign Sector Account and Subsectors for the period 2010*, also compiled by the Spanish Institute of Statistics. The result of separating the Foreign Sector in these two sub-sectors is presented in Table 6.

B) Treatment of the purchases by residents out of the economic territory and purchases by non-residents in the territory. In the official Input-Output Tables, no-resident consumption is incorporated down the private final consumption column. In order to evaluate in an appropriate way impacts on resident consumption patterns when changes in indirect taxes take place i.e. variations in value-added taxes, it is necessary then to differentiate between nonresidents' consumption in the territory and residents' consumption out of the territory. In doing so, we have used the information on nonresidents' and residents' consumption patterns contained in the *Tourism Satellite Accounts* compiled by the Spanish National Institute too. Then, the nonresidents' consumption has been redistributed down the columns that referring the European Union and Rest of the World Exports. The same complementary data set has been employed to incorporate residents' consumption out of the territory along the foreign sectors' import rows.

Table 7a.Distribution (receipts) of Social Contributions by Type among Resident Institutions. Units: Millions of Euros 2010.					
	Employers	**Employees**	**Self-employed**	**Unemployment**	**Total**
Financial and Non-Financial Institutions	11.854,90	1.671	2272	0	***15.797,9***
NPISH	47	0	0	0	***47***
Public Administration	100.470	20.385	10.461	8.126	***139.442***
Households	396	0	0	0	***396***
Total	***112.768***	***22.056***	***12733***	***8126***	

Table 7b. Social Contributions Collected and Distributed by Resident and Non Resident Institutions by type. Units: Millions of Euros 2010.							
	Total Collected	**Use Table**	**Foreign Sector**	**Households**	**Total Distributed**	**Resident Institutions**	**Foreign Sector**
Employers	113.024	112.959	65	0	113.024	112.768	256
Employees	22.166		0	22.166	22.166	22.056	110
Self-employed	12.733			12.733	12733	12.733	
Unemployed	8.126			8.126	8.126	8.126	
Total	***156.049***			***43.025***	***156.049***	***155.683***	

C) Disaggregation of social contributions payments by type and institution. The amount of Social Contributions paid by employers have been computed using the information contained in the Use Table. The figure relating the total social contributions paid by households (employees, self-employees and unemployed households) was extracted from households' uses of income reflected within the Integrated Annual Accounts of Institutional Sectors. Nevertheless, in dealing consistently with the potential impacts of fiscal reforms that affect direct taxes i.e. computed changes in labor tax burdens or fiscal tax wedge, is crucial to have a complete picture about how social contributions are allocated within the whole economic system i.e. institutions' payments and receipts by type of social contribution. With this objective, and following again the approach of Álvarez-Martínez and Polo (2014), we have used the figures published in the Annex Tables regarding the *Social Contributions by type and Destination Sector* also constructed by the Spanish National Institute of Statistics. The result of making these figures compatible with those included in the Integrated Annual Accounts of Institutional Sectors and the Use Table for the Spanish economy for the period 2010 is depicted in Table 7a and Table 7b.

D) Unemployment Benefits. Households' unemployment benefits are included within welfare benefits. Since in our CGE approach, we have modelled unemployment introducing a wage curve (See Section 3.5), we have seen adequate disaggregating unemployment benefits. The figure that corresponds to the total unemployment benefits has been obtained from the Statistical Data published by the Spanish Ministry of Labor and Social Protection.

4.2.2. The Construction of the Microeconomic SAM-SPAIN2010.

The macro SAM gives a very simple and compact representation of all aggregate flows in a base period. However, depending on the objectives of the analysis, sometimes is necessary to provide finer detail in any of its accounts. Factors can be disaggregated by qualification or productivity

i.e. skilled, medium-skilled and low-skilled labor. Households can likewise be distinguished by income levels, major income source, the composition of the household and other socioeconomic characteristics such as living in urban areas versus living in rural areas.

For the context of our analysis, evaluation of fiscal policies (particularly those that tackle changes in personal income taxes) we have differentiated between nine types of households organized by taxable income levels or brackets. Then, for each taxable income bracket, we have computed the part of income that corresponds to all possible households' income sources contemplated in the macro SAM: gross labor income, social contributions paid by households, gross operating surplus/mixed income and property income including the corresponding amount of personal income taxes faced by each household type. The classification based on these nine taxable income brackets[4] has been made according to the income level of the main breadwinner. This information has been extracted from the Filers Panel constructed by the Spanish Institute for Fiscal Studies.

Table 8.Description of Taxable Income Brackets used for classification of Households used in the Microeconomic SAM-SPAIN2010.

Income bracket	Sampling Taxable Income	No. Obs.
1	From Negative, zero to 3.000,00	61.433
2	From 3.000,01 to 6,000.00	20.934
3	From 6.000,01 to 12,000.00	67.511
4	From 12.000,01 to 18,000.00	70.772
5	From 18.000,01 to 30,000.00	104.432
6	From 30.000,01 to 60,000.00	120.958
7	From 60.000,01 to 120,000.00	51.215
8	From 120.000,01 to 240,000.00	18.837
9	From 240,000.00 onwards	12.009
Total		**528.101**

This rich Filers Panel runs from 1999 to 2010 and that covers the entire universe of Spanish taxpayers (except for the regions of Navarra and the Basque Country, since they have special regimes). After filtering data, the number of statements in the sample was 528,101 tax statements, representing a population of 19,257,120 individuals. The definition of the income brackets together with the number of observations contained in each bracket is presented in Table 8.

For the purposes of our analysis already outlined in Section 1, the incorporation fiscal information that allows classifying households according to the level of taxable income enables us to evaluating the total macroeconomic (direct, indirect and induced) and microeconomic effects of personal income tax Reforms in a more comprehensive manner than previous analysis. This is so since in the 'real world' the average effective rates of personal income taxes, vary according to taxable income brackets in general and in particular in the Spanish economy. Consequently, the changes in these average effective tax rates for each taxable income bracket derived from the tax reform can be evaluated in a more 'realistic' way, controlling for the modification in the degree of progressivity of the personal income tax system. Furthermore,

[4] For the selection of data has been necessary to resort to three different databases and the breakdown by income brackets may vary slightly among these three samples. For this reason, we have chosen the selection of households by income brackets offered by Filers Panel obtained from Institute for Fiscal Studies.

differentiating for the weight that each possible income source has in determining gross disposable income as well as the amount of labor and direct tax liabilities for each household category makes possible to extract from our static comparative exercises additional policy distributive effects such as the potential impacts in fiscal pressure on labor i.e. the tax wedge by household type.

In turn, we need to include not only the income earned from the productive activity and reflected in the tax statements described above but other sources of income that mainly refer to government transfers. Thus, for our analysis, we must also consider pensions and unemployment benefits available on the **Survey of Living Conditions**. This database includes employment, status, job experience, education, occupation, and industry. In our case, we use that information only on personal income and benefits relating to main breadwinner. For sake of homogeneity, for the classification by taxable income levels, we used the same distribution by income brackets followed in previous cases. So, we have collected information, apart from monetary employee income (or quasi), on unemployment benefits and retirement benefits, both in net terms. The sample, after data cleaning, gathered a total of 13,109 main breadwinners.

Table 9a: Assignment of the amount of the major income sources by household type and PIT and Social Security Contributions liabilities. Microeconomic SAM-SPAIN2010. Sources: Integrated National Accounts of Institutional Sectors, Survey of Living Conditions and Survey of Personal Income Tax Payers.

	Labor Income (net from social security contributions paid by employers) A	Gross Operating Surplus and Mixed Income B	Property Income C	Current Transfers (Welfare Benefits and other Current Transfers)* D	Unemployment Benefits E	Social Security Contributions paid by Households** F	Total PIT G
1	1.869,602	0	1,17220972	51.469,72	925,279	317,20039	104,15
2	1.764,164	10,7654461	1,4387389	14.245,82	2.832,540	706,870823	17,041
3	13.770,550	55,659857	5,85281025	35.699,59	2.917,259	16.361,7857	14,50
4	25.364,488	69,9907343	8,52017259	23.828,43	2.750,266	2.171,18275	563,72
5	62.803,219	10.903,8471	19,8757393	23.523,76	2.400,077	4.292,06363	2.366,12
6	125.776,198	182,196692	54,2909848	19.787,179	2.158,440	7.146,78269	7.344,70
7	79.059,930	306,632394	87,750174	15.662,77	5.759,673	3.687,9286	20.209,17
8	41.907,416	338,75278	88,6700732	0	13.544,978	3.968,51063	20.370,46
9	77.250,431	151.442,155	49274,4291	5967,711	3.943,487	4.392,67479	26.988,105
Households' Aggregate According to National Accounts	**429.566,000**	**163.310,000**	**49.542,000**	**190.185,000**	**37.232,000**	**43.025,000**	**78.104,000**

Notes: A: Calibrated through component LI: Labor Income reported in the Survey of Personal Income Tax Payers, minus pensions and unemployment benefits taken from the Survey of Living Conditions. B: Calibrated through component EAI: Income from economic activities reported in the Survey of Personal Income Tax Payers. C: Calibrated through component SIC+RI: stock income and rental income reported in the Survey of Personal Income Tax Payers. D and E: Calibrated through the information extracted from the Survey of Living Conditions. F: Calibrated from the difference between the components TLI-LI: Total Labor Income minus Labor Income. G: Calibrated from the information in the Survey of Personal Income Tax Payers.

***The Current Transfers exclude Unemployment Benefits. **Social Security Contributions paid by Household include those related to employees, self-employees and unemployed Households.**

Table 9b: Assignment of the weights in % on gross income of the major income sources by household type. Microeconomic SAM-SPAIN2010. .				
	Labor Income A	**Gross Operating Surplus and Mixed Income B**	**Property Income C**	
1	99,937	0	0,0626	**100**
2	99,312	0,606	0,0809	**100**
3	99,555	0,402	0,0423	**100**
4	99,691	0,275	0,0334	**100**
5	85,180	14,789	0,0269	**100**
6	99,812	0,144	0,0430	**100**
7	99,503	0,385	0,1104	**100**
8	98,990	0,800	0,2094	**100**
9	27,7912	54,482	17,726	**100**

The result of merging these two data sets i.e. **The Survey of Living Conditions and Survey of Personal Income Tax Payers** in the Spanish Economy for the year 2010, allows us to obtained a complete picture about the contribution of each income source to gross disposable income for each household type according to the classification presented in Table 8 and the corresponding tax liabilities that relate to both personal income tax and labor taxes (social contributions). The derived outcome and the procedure to calibrate each household income source is presented in Table 9a. Notice that, according to Table 9b, low and middle income households (according to taxable income) rely in a larger extent on labor income (wage and salaries, pensions and unemployment benefits) than high income households' whose major income sources are property income along with capital income (gross operating surplus and mixed income).There is an extensive body of empirical literature on how own-price elasticities (in turn, affected by changes in VAT, as we see later), expenditure elasticities (affected by changes in individual income tax) vary depending on household income and also affect consumer behavior as income levels, among other factors[5] (Ahmed and Shams, 1994; Armagan and Akbay, 2008). Based on this evidence, it is therefore likely that changes in prices or income affect high-income and lower-income households very differently. Inasmuch as there are strong consumer behavior differences through income levels, another important consideration is to integrate the consumption expenses of the Spanish population in order to match this information with the one gathered from the tax returns. This database is collected from the **Household Budget Survey** obtained by Spanish Statistics Institute and is divided into three files: "households", "members of the households" and "expenditures". It contains information about characteristics of the households and the main breadwinner, main housing or other housing, household consumption expenditure and regular household income[6]. In particular, the expenditure file includes consumption patterns for different goods and services, according to the COICOP (we used

[5] About the connection between the level of household income and its consumption structure see, for example, Houthakker and Taylor (1970). These authors used US data referred to the first three thirds of the XX century and showed estimations of own-price and expenditure elasticities were significantly different between income quartiles.

[6] The information about regular household income in this database is usually not available since it was obtained from a survey and individuals are not always willing to reveal the earned income. This is why we have selected Filers Panel for this information, containing accurate and richer content about earnings and incomes.

disaggregated data at three digits). The final result of assigning the remaining uses of income apart from tax liabilities already reported in Table 9a, for each household category is reported in Table 10. Since for each COICOP classification many industries/products are involved, it was necessary to construct a 'conversion' matrix in order to redistribute the consumption flows of each COICOP to its corresponding group of industries/products. We have built this conversion matrix with the help of the Correspondence Table between the CPA-2008 and the COICOP classification provided by **RAMON** (Reference and Management of Nomenclatures) compiled by Eurostat and a wide variety of statistical sources that refer to the supply side and that have been obtained from the Spanish Institute of Statistics, namely, the **Spanish Industrial Survey of Products and the Spanish Annual Survey of Services.** Then, once again, we have used the RAS method to make households final consumption by type of industry/product to match the data reflected in the estimated SIOT for the Spanish economy. The weights of final consumption by type of household for the 40 industry/products contemplated in our approach is presented in Table 11.

Table 10: Assignment of the amount of the major income uses by household type Microeconomic SAM-SPAIN2010. Sources: Integrated National Accounts of Institutional Sectors, Survey of Living Conditions and Survey of Personal Income Tax Payers.

Income Brackets	Final Consumption H	Households' Transfers payments I	Property Income Payments J	Savings K
1	30.020,8444	2.587,45301	17.847,3257	3386,43733
2	15.077,3588	1.299,49567	52,8138	1700,7693
3	29.950,8185	2.581,41758	32,6758	3378,5382
4	41.086,2635	3.541,16542	11,9625	4634,64832
5	77.510,086	6.680,48182	5,1280	8743,35994
6	111.174,384	9.581,95878	3,5226	12540,7892
7	63.821,6242	5.500,69316	0,8659	7199,2622
8	25.921,1907	2.234,1098	0,7055	2923,98463
9	21.3418,43	18.394,2248		24074,2108
Households' Aggregate According to National Accounts	**607.981,000**	**52.401,000**	**17.955,000**	**68.582,000**

Notes: H: Approximated from the information contained within the Household Budget Survey. The net regular household income considered to approximate both total final consumption and consumption patterns is the following: For households 1,2, 3 a monthly net regular household income between 2,000-2,499 euros; for household 4 and 5 a monthly net regular household income between 2,500-2.999 euros; for household 6 and 7 a monthly net regular household income between 3.000-4.999 euros and for household 8 and 9 a monthly net regular household income larger than 5.000 euros. In making this assignment we have assumed a minimum exempt yearly income of 12.000 euros. I and J approximated through considering an inverse distribution according to D and C, respectively. K: for the adjustment of Households' savings, we have considered an average propensity to save of 11% (Spanish Central Bank, 2012).

Table 11.Weights of Products/Industries on Households Final Consumption. Household Budget Survey and Integrated National Accounts.										
Income Bracket	**01-03**	**05-09**	**10-12**	**13-15**	**16-18**	**19**	**20-21**	**22**	**23**	**24**
1	2,5653	0,0046	14,7425	3,6394	0,2314	3,8272	1,6684	0,1369	0,0928	0,0004
2	2,5653	0,0046	14,7425	3,6394	0,2314	3,8272	1,6684	0,1369	0,0928	0,0004
3	2,5653	0,0046	14,7425	3,6394	0,2314	3,8272	1,6684	0,1369	0,0928	0,0004
4	2,5653	0,0046	14,7425	3,6394	0,2314	3,8272	1,6684	0,1369	0,0928	0,0004
5	2,1007	0,0051	11,3918	3,4464	0,2179	3,6857	1,5171	0,1293	0,0829	0,0004
6	2,1007	0,0051	11,3918	3,4464	0,2179	3,6857	1,5171	0,1293	0,0829	0,0004
7	1,8899	0,0043	8,7844	4,6492	0,4989	3,5113	3,1621	0,1942	0,1053	0,0013
8	1,8899	0,0043	8,7844	4,6492	0,4989	3,5113	3,1621	0,1942	0,1053	0,0013
9	1,8899	0,0043	8,7844	4,6492	0,4989	3,5113	3,1621	0,1942	0,1053	0,0013
	25	**26-27**	**28**	**29**	**30**	**31-32**	**33**	**35**	**36**	**37-39**
1	0,1383	1,3232	0,0646	1,5893	0,1599	1,4644	0,0304	3,9927	0,5247	0,3206
2	0,1383	1,3232	0,0646	1,5893	0,1599	1,4644	0,0304	3,9927	0,5247	0,3206
3	0,1383	1,3232	0,0646	1,5893	0,1599	1,4644	0,0304	3,9927	0,5247	0,3206
4	0,1383	1,3232	0,0646	1,5893	0,1599	1,4644	0,0304	3,9927	0,5247	0,3206
5	0,1344	1,1822	0,0622	1,8465	0,1857	1,4249	0,0359	2,9955	0,4099	0,2505
6	0,1344	1,1822	0,0622	1,8465	0,1857	1,4249	0,0359	2,9955	0,4099	0,2505
7	0,2217	1,5038	0,0672	2,7908	0,2807	2,2640	0,0238	2,8515	0,5184	0,3167
8	0,2217	1,5038	0,0672	2,7908	0,2807	2,2640	0,0238	2,8515	0,5184	0,3167
9	0,2217	1,5038	0,0672	2,7908	0,2807	2,2640	0,0238	2,8515	0,5184	0,3167
	41-43	**45-47**	**49-51**	**52**	**55-56**	**58-60**	**61-65**	**66**	**67**	**68**
1	0,9224	17,9002	1,1171	0,0295	10,0382	1,7945	2,9917	3,1864	13,9523	0,4856
2	0,9224	17,9002	1,1171	0,0295	10,0382	1,7945	2,9917	3,1864	13,9523	0,4856
3	0,9224	17,9002	1,1171	0,0295	10,0382	1,7945	2,9917	3,1864	13,9523	0,4856
4	0,9224	17,9002	1,1171	0,0295	10,0382	1,7945	2,9917	3,1864	13,9523	0,4856
5	0,7284	31,7286	1,1208	0,0515	11,0504	2,1169	2,5537	2,8924	5,2465	0,5728
6	0,7284	31,7286	1,1208	0,0515	11,0504	2,1169	2,5537	2,8924	5,2465	0,5728
7	1,1863	0,0000	1,5078	0,0000	17,6537	0,0000	2,2859	3,6970	24,4206	0,3788
8	1,1863	0,0000	1,5078	0,0000	17,6537	0,0000	2,2859	3,6970	24,4206	0,3788
9	1,1863	0,0000	1,5078	0,0000	17,6537	0,0000	2,2859	3,6970	24,4206	0,3788
	69-75	**78**	**79**	**80-82**	**84**	**85**	**86**	**87-88**	**90-96**	**97-99**
1	0,2348	0,0005	0,6020	0,0934	0,0814	0,5222	2,3326	1,0080	2,0904	4,0997
2	0,2348	0,0005	0,6020	0,0934	0,0814	0,5222	2,3326	1,0080	2,0904	4,0997
3	0,2348	0,0005	0,6020	0,0934	0,0814	0,5222	2,3326	1,0080	2,0904	4,0997
4	0,2348	0,0005	0,6020	0,0934	0,0814	0,5222	2,3326	1,0080	2,0904	4,0997
5	0,2770	0,0006	0,7565	0,0737	0,0934	0,8289	2,0468	1,1891	2,3263	3,2404
6	0,2770	0,0006	0,7565	0,0737	0,0934	0,8289	2,0468	1,1891	2,3263	3,2404
7	0,1832	0,0004	1,7933	0,1201	0,1405	2,5844	2,2275	0,7864	2,8331	4,5615
8	0,1832	0,0004	1,7933	0,1201	0,1405	2,5844	2,2275	0,7864	2,8331	4,5615
9	0,1832	0,0004	1,7933	0,1201	0,1405	2,5844	2,2275	0,7864	2,8331	4,5615

5. SIMULATED TAX REFORMS AND RESULTS: ACTUAL VERSUS ALTERNATIVE.

5.1. Evaluating Actual Tax Reforms:

5.1.1. Increasing Value-Added Tax Rates: Effectiveness, Efficiency and Distributional Impacts.

As part of a plan to help avert a fiscal crisis that derives in uncontrolled increments in public deficits and thus in public debts, the preferred option chosen by the Spanish government was to increase VAT rates first in 2010 and later on, in 2012. Like Spain, many other EU Member States also introduced changes in the structure of the VAT i.e. changes in the statutory value-added tax rates, in the tax base and in the special regimes. This was, for instance, the case of France, Italy, The Netherlands, Belgium and Portugal. Compared to other fiscal reform measures, favoring fiscal consolidation through an increase in the VAT presents several advantages: leads to a smaller increase in marginal tax rates on labor (labor tax burden) and lowers governments' spending by reducing the real cost of the commodities acquired by the governments. In fact, as stated in section 2, the VAT constitutes the main tax collection instrument over consumption not only in the Spanish economy but also in the context of the EU. In 2014, the VAT revenue represented 34 percentage points of the total tax revenue obtained from indirect taxation in the EU-2008 (Eurostat, Tax Statistics, 2016). In the Spanish economy, this figure amounted to 53.55 percentage point (Eurostat, Tax Statistics, 2016). The large contraction in GDP that took place in the Spanish economy in 2009 and the rapid increase on unemployment levels in the Spanish economy, led to an important decline in the tax revenues (See Section 2). Consequently, the Spanish government opted to 'compensate' this decline through an increase in the VAT rates as an attempt to contain the continuous deterioration of the public deficit. Nevertheless, the use of indirect taxes to control public deficits has disadvantages too: imposes a larger burden on low and middle income households and generates a significantly increase in compliance and administrative costs for governments.

In Sum, the aim of the Spanish government at that moment was to increase the effectiveness in controlling the increase in public deficit while leaving aside the potential welfare losses (efficiency effects) as well as the possible deterioration of income equality distribution (distributive effects) of increasing VAT. Using the model structure described in Section 3 and the SAM-SPAIN2010 disaggregated by 9 types of households presented in Section 4 , in this section we present and analyzed the results of evaluating the fiscal tax reform that affected the VAT structure since September 2012 in terms of efficiency i.e. changes in GDP and its supply, income and demand components, effectiveness i.e. changes in public deficit and its determinants and distributional impacts i.e. Changes in Utility Levels, Fiscal wedge and changes in labor tax burdens for each household type according to the classification outlined in Table 8. The description of the first static comparative exercise for evaluating the impacts of the VAT Reform carried out by the Spanish Government in 2012 is depicted is Table 12. The Fiscal Reform that affected the VAT (in force since September 2012) consisted in a 2 and 3 percentage points increase in the reduced (from 8% to 10%) and the general rate respectively (from 18% to 21%). Down the four first columns of Table 12, we present the applied and average tax rates before and after the application of the policy for each industry/product. This information was taken from The Spanish Public Sector Database (BADESPE). Even though the original VAT-rates published by BADESPE referred to the CPA-96 classification, the authors adjusted it classification to the actual one i.e. CPA-2008. The last column of Table 12 shows the simulated relative change in industries'/products' VAT rates conducted through our Static General Equilibrium Model.

Table 12. Initial and New Equilibrium VAT Rates : Evaluation of the VAT rates increases in 2012.					
	VAT RATES 2010		VAT RATES 2012		Evaluated Change in Tax Rates
Products' group Description	Applied Tax Rates	Average Tax Rates	Applied Tax Rates	Average Tax Rates	
Agriculture, Hunting, Forestry and Fishing Products	4,7,8,16,18	9,5	4,10,21	11,6	0,221
Mining and Quarrying Products	16,18	17	21	21	0,235
Food, Beverages and Tobacco Products	4,7,8,16,18	9,5	4,10,21	11,6	0,221
Textile, Leather and Footwear Products	16,18	17	21	21	0,235
Wood, Cork, Pulp, Paper Products, Printing and Publishing	16,18	17	21	21	0,235
Coke, Refined Petroleum and Nuclear Fuel	16,18	17	21	21	0,235
Chemical and Pharmaceutical Products	4,7,8,16,18	9,5	4,10,21	11,6	0,221
Rubber and Plastic Products	7,8,16,18	12,25	10,21	15,5	0,265
Other Non-Metallic Mineral Products	16,18	17	21	21	0,235
Basic Metals and Fabricated Metal Products	16,18	17	21	21	0,235
Metallic Products not including Machinery and Equipment	16,18	17	21	21	0,235
Electrical and Optical Equipment	16,18	17	21	21	0,235
Transport Equipment	16,18	17	21	21	0,235
Motor Vehicles and Trailers	16,18	17	21	21	0,235
Other Transport Equipment, Nec	16,18	17	21	21	0,235
Furniture and other manufacturing products, nec	16,18	17	21	21	0,235
Repair and Instalation activities	16,18	17	21	21	0,235
Electricity and Gas	7,8,16,18	12,25	10,21	15,5	0,265
Water Supply	7,8	7,5	10	10	0,333
Sewerage, Waste management and remediation services	7,8	7,5	10	10	0,333
Construction	7,8,16,18	12,25	10,21	15,5	0,265
Wholesale Trade and Retail Trade	4,7,8,16,18	9,5	4,10,21	11,6	0,221
Transport Services and Storage Services	7,8,16,18	12,25	10,21	15,5	0,265
Post Services	Ex.16,18	8,5	Ex.16/18	9	0,059
Accommodation and Food Services	7,8	7,5	7,8	10	0,333
Publishing, motion picture, video and television programme production services	4,16,18	10,5	4,21	12,5	0,190
Other Information and Communication Services	16,18	17	21	21	0,235
Financial and Insurance Services	Ex.16,18	8,5	Ex.21	10,5	0,235
Real Estate Activities	7,8,16,18	12,25	10,21	15,5	0,265
Professional,Scientific and Technical Services	7,8,16,18	12,25	10,21	15,5	0,265
Renting of Machinery and Equipment	16,18	17	21	21	0,235
Employment related Services	-	-	-		
Travel Agencies' activities and related activities	Ex.7,8,16,18	8,167	Ex.10,21	10,33	0,265
Security, Research, Administrative and Business Activities	16,18	17	21	21	0,235
Public Admin and Defence; Compulsory Social Security	-				0,000
Education activities	Ex.7,8,23	10,167	Ex.10/23	11	0,082
Health activities	Ex.7,8	3,75	Ex.10	5	0,333
Social Work activities	Ex.7,8	3,75	Ex.10	5	0,333
Other Community, Social and Personal Services	7,8,16,18	12,25	10,21	15,5	0,265
Other services, nec		-		-	

Table13 a. Macroeconomic Impacts (Efficiency and Effectiveness) of the VAT-Tax Reform 2012 in the Spanish Economy. Absolute values in Millions of Euros			
	Initial Equilibrium Values.	**Final Equilibrium Real Values*** **	**Evaluated Relative Impact in %**
Gross Domestic Production	**1.080.913**	**1.072.528**	**-0.775**
Average CPI	**1,000**	**1,024**	**2.40**
Unemployment Rate in %	**20,30**	**20,71**	**-**
Private Savings	**251.858**	**250.196**	**-0,659**
Public Savings	**-39.288**	**-30.958**	**-21,20**
Public Deficit relative to GDP in %	**3,63**	**2,88**	
Deficit Balance of Payments	**41.979**	**40.095**	**-4,48**
Average Fiscal Wedge in %	**36,41**	**36,77**	**0,98**
Demand GDP Components			
-Private Final Consumption	**607.981**	**598.349**	**-1,584**
-Public Final Consumption	**232.489**	**231.641**	**-0,364**
-Gross Capital Formation	**254.549**	**253.491**	**-0,415**
-Exports	**275.847**	**276.351**	**0,1820**
-Imports	**289.953**	**287.305**	**-0,913**
Income GDP Components			
-Gross Wages and Salaries	**541.475**	**531.285**	**-1,880**
-Gross Operating Surplus/Mixed Income	**445.879**	**435.118**	**-2,413**
-Net Taxes on Imports and Products	**93.559**	**106.125**	**13,43**

******Evaluated Impacts in Real terms are computed as relative measures to the CPI under the new equilibrium.***

The evaluated macroeconomic impacts of the VAT Reform of 2012 are reflected in Table 13a. As expected, our findings indicate that the increase VAT rates erodes GDP by 0,772 percentage points mainly due to the decline in private final consumption levels that follows the increase in market price levels (2,40 percentage points on average) and the simultaneous decrease in households' gross income. Negative impacts also take place in employment levels i.e. unemployment raises from 20,3 to 20,71 percentage points. In line with what is predicted by economic theory, the increase in the average fiscal wedge computed as the ratio of personal income taxes that stem from labor income plus total households and employers social contributions to total labor income, indicates that the increase in indirect taxes boosts fiscal pressure on labor. Public deficit, instead, reduces from 3,63 to 2,84 as a percentage of GDP thanks to the remarkable increase in tax revenues coming from indirect taxation: net taxes on imports and products raise up to 13,43 percentage points. In fact, the later constituted the main task pursued by the Spanish government at that time with this tax reform: to control public deficit at short term. As can asserted from the results of the simulation, the purpose of fiscal consolidation was attained at the expense of economic efficiency losses.

Table 13 b. Microeconomic Impacts. Distribution of Welfare Losses and Changes in Fiscal Wedge of VAT- Reform 2012 in the Spanish Economy.			
Income bracket	**Sampling Taxable Income**	**Equivalent Variation relative to Net Disposable Income**	**Changes in Fiscal Wedge**
1	From Negative and zero to 3.000,00	**1,93**	**0,601**
2	From 3.000,01 to 6,000.00	**2,03**	**1,949**
3	From 6.000,01 to 12,000.00	**2,19**	**0,253**
4	From 12.000,01 to 18,000.00	**1,20**	**0,129**
5	From 18.000,01 to 30,000.00	**0,56**	**0,044**
6	From 30.000,01 to 60,000.00	**0,39**	**0,017**
7	From 60.000,01 to 120,000.00	**0,76**	**0,060**
8	From 120.000,01 to 240,000.00	**1,03**	**0,220**
9	From 240,000.00 onwards	**0,46**	**0,052**

In Table 13b, we report the equivalent variation relative to net disposable income levels along with changes in fiscal wedge for each household associated with the evaluated impact of the VAT Reform of 2012. The fact that the increase level on taxes is distorting is indicated by the welfare losses that affects all household categories. The distributive impacts of the VAT-Tax Reform of 2012 revealed, however, that the changes in prices affects more those households that own lower income levels. These outcomes indicate that, this tax reform was quite regressive affecting in a larger extent the poorest group of households. Similar conclusions can be drawn from the variation of the Tax Wedge reported down the last column of Table 13b.

5.1.2. Changing Personal Income Taxes: Effectiveness, Efficiency and Distributional Impacts.

Recent measures undertaken since 2015 such as the PIT reform in the Spanish economy, have probably shifted the policy priorities towards the improvement of income distribution while boosting economic growth. The first package of the PIT reform, in force since January 2015, pursued a simplification of the PIT structure i.e. the tax brackets in the general tax base were reduced from seven to five while reducing the maximum and the minimum tax rates i.e. the maximum tax rates moved from 52% to 46% while the minimum form 24.75% to 19,5%. Meanwhile, in the savings tax rates, the schedule was amplified from two (19% and 21%) to three brackets, with marginal taxes increased in each of them: 21%, 25% and 27%. The second package of the PIT reform was implemented one year later, in 2016, and consisted in a further reduction of the maximum and minimum tax rates, to 45% and 19% respectively as well as the marginal ones corresponding to the savings tax base (19.5%, 21.5% and 23.5%, respectively).

Table 14. Initial and New Equilibrium PIT Rates : Evaluation Personal Income Tax Reforms 2015-2016						
Income bracket	**Sampling Taxable Income**	**Average Personal Income Tax Rate 2010**	**Average Personal Income Tax Rate First Package 2015**	**Evaluated Change in Average Tax Rates 2010-2015**	**Average Personal Income Tax Rate Second Package 2016**	**Evaluated Change in Average Tax Rates 2015-2016**
1	From Negative and zero to 3.000,00	**24,75**	**20,00**	**-0,1919**	**19,00**	**-0,050**
2	From 3.000,01 to 6,000.00	**24,75**	**20,00**	**-0,1919**	**19,00**	**-0,050**
3	From 6.000,01 to 12,000.00	**24,75**	**20,00**	**-0,1919**	**19,00**	**-0,050**
4	From 12.000,01 to 18,000.00	**26,50**	**22.16**	**-0,1698**	**21,14**	**-0,039**
5	From 18.000,01 to 30,000.00	**27,90**	**25,70**	**-0,0788**	**24,68**	**-0,039**
6	From 30.000,01 to 60,000.00	**33.95**	**32.35**	**-0,0471**	**30.84**	**-0,0516**
7	From 60.000,01 to 120,000.00	**40,47**	**39.67**	**-0,0197**	**37,92**	**-0,0441**
8	From 120.000,01 to 240,000.00	**45.73**	**43,33**	**-0,052**	**41,46**	**-0,0431**
9	From 240,000.00 onwards*	**47,71**	**44,55**	**-0,066**	**42,64**	**-0,0420**

***For computing the maximum average tax rate we have considered 360.000 euros as maximum income.**

Table 14 illustrates the way we have introduced the two package PIT reforms undertaken by the Spanish government from 2015 to 2016. Notice that it was the first package of the PIT reform that contemplated more generous 'tax cuts' for low income households than for middle and high income households, as an effort to increase or at keep the degree of progressivity of the PIT. In our analysis we only take into account the variations in the maximum and minimum rates. Although we are aware about the relevance of altering the way savings are taxed i.e. they may change remarkably households' behavior decisions in terms of savings and thus consumption levels, we will address this issue in future research.

Table 15a. Macroeconomic Impacts (Efficiency and Effectiveness) of PIT Reforms undertaken in the Spanish Economy 2015-2016. Absolute values in Millions of Euros.			
First Package PIT Reform 2015 after the VAT Reform 2012 in the Spanish Economy			
	Initial Equilibrium Values.	**Final Equilibrium Real Values*** **	**Evaluated Relative Impact in %**
Gross Domestic Production	**1.072.528**	**1.074.892**	**0,220**
Average CPI	**1,024**	**1,0210**	**-0,030**
Private Savings	**250.196**	**250.921**	**0,280**
Public Savings	**-30.958**	**-35.070**	**13,28**
Public Deficit relative to GDP in %	**2,88**	**3,26**	
Deficit Balance of Payments	**40.095**	**40.543**	**1,11**
Average Fiscal Wedge in %	**36,77**	**36,39**	**0,380**
Revenues from Personal Income Tax	**78.104**	**77.830**	**-0.350**
Demand GDP Components			
-Private Final Consumption	**598.349**	**603.810**	**0,912**
-Public Final Consumption	**231.641**	**231.288**	**-0,152**
-Gross Capital Formation	**253.491**	**251.470**	**-0,790**
-Exports	**276.351**	**276.245**	**-0,038**
-Imports	**287.305**	**287.858**	**0,190**
Income GDP Components			
-Gross Wages and Salaries	**531.285**	**531.785**	**0,091**
-Gross Operating Surplus/Mixed Income	**435.118**	**436.690**	**0,361**
-Net Taxes on Imports and Products	**106.125**	**104.283**	**-1,733**
Second Package PIT Reform 2016 after the VAT Reform 2012 and the First Package of PIT Reform in 2015 the Spanish Economy.			
	Initial Equilibrium Values.	**Final Equilibrium Real Values*** **	**Evaluated Relative Impact in %**
Gross Domestic Production	**1.074.892**	**1.074.564**	**-0,03**
Average CPI	**1,0210**	**1,020**	**0,01**
Private Savings	**250.921**	**251.254**	**0,13**
Public Savings	**-35.070**	**-38.772**	**10,55**
Public Deficit relative to GDP in %	**3,26**	**3,60**	
Deficit Balance of Payments	**40.543**	**40.297**	**0,606**
Average Fiscal Wedge in %	**36,39**	**35,964**	
Revenues from Personal Income Tax	**77.830**	**74.182**	**- 4,68**
Demand GDP Components			
-Private Final Consumption	**603.810**	**606.791**	**0,490**
-Public Final Consumption	**231288**	**231259**	**-0,012**
-Gross Capital Formation	**251.470**	**247.960**	**-1,400**
-Exports	**276.245**	**276.236**	**-0,032**
-Imports	**287.858**	**287.682**	**-0,061**
Income GDP Components			
-Gross Wages and Salaries	**531.785**	**531.371**	**-0,077**
-Gross Operating Surplus/Mixed Income	**436.690**	**436.827**	**0,031**
-Net Taxes on Imports and Products	**104.283**	**106.367**	**1,99**

******Evaluated Impacts in Real terms are computed as relative measures to the CPI under the new equilibrium.***

In Table 15a, we show the macroeconomic impacts when sequentially evaluating the Value-Added Tax Reform of 2012, the first package and the second package of the PIT reform both described in Table 14. As can be asserted from the results presented in this table, the PIT cuts under the first and the second package of the Reform barely favored the recovery of GDP levels. i.e. a 0,22 and -0,03 percentage points change in real GDP under the first and second package respectively. According to our findings, the decrease in investment flows outperformed the recovery in consumption levels derived from the PIT cuts. Nevertheless, even though the impact on economic growth was not remarkable, this was not the case in terms of fiscal pressure. The average fiscal wedge, retreats to around 36,39 percentage points under the first package and 35,946 under the second package, a level that was even below that prevailing before the VAT-Fiscal Reform of 2012. Public deficit deteriorates moving from 2,84 percentage points to 3,26 percentage points relative to real GDP levels mainly due to the decline of the revenues collected by PIT after the tax rate cuts.

Table 15b. Microeconomic Impacts (Distributive effects) of PIT Reforms undertaken in the Spanish Economy 2015-2016. Changes in Utility Levels and Fiscal Wedge in %.			
First Package PIT Reform 2015 after the VAT Reform 2012 in the Spanish Economy			
	Sampling Taxable Income	**Changes in Utility Levels**	**Changes in Fiscal Wedge**
1	From Negative and zero to 3,000,00	**0,06**	**0,00**
2	From 3,000,01 to 6,000,00	**0,04**	**0,09**
3	From 6,000,01 to 12,000,00	**0,10**	**0,02**
4	From 12,000,01 to 18,000,00	**0,18**	**-0,17**
5	From 18,000,01 to 30,000,00	**0,17**	**-0,18**
6	From 30,000,01 to 60,000,00	**0,22**	**-0,25**
7	From 60,000,01 to 120,000,00	**0,51**	**-0,40**
8	From 120,000,01 to 240,000,00	**4,30**	**-0,21**
9	From 240,000,00 onwards	**0,77**	**-0,61**
Second Package PIT Reform 2016 after the VAT Reform 2012 and the First Package of PIT Reform in 2015 the Spanish Economy.			
Income bracket	**Sampling Taxable Income**	**Changes in Utility Levels**	**Changes in Fiscal Wedge**
1	From Negative and zero to 3,000,00	**0,013**	**0,090**
2	From 3,000,01 to 6,000,00	**0,0225**	**0,170**
3	From 6,000,01 to 12,000,00	**0,0350**	**0,040**
4	From 12,000,01 to 18,000,00	**0,0135**	**-0,201**
5	From 18,000,01 to 30,000,00	**0,0644**	**-0,269**
6	From 30,000,01 to 60,000,00	**0,2282**	**-0,536**
7	From 60,000,01 to 120,000,00	**1,3640**	**-1,390**
8	From 120,000,01 to 240,000,00	**2,8430**	**-3,640**
9	From 240,000,00 onwards	**0,4610**	**-0,977**

In terms of the distributive effects outlined in Table 15b, the introduced tax cuts in the PIT, lead to an improvement in utility levels to in all households' categories. However, high income households groups (Households' with Taxable income from 30,000,01 onwards) benefit the most once overall impacts of the policy reform are controlled for. According to our results, this was the case even though even though tax cuts were less pronounced than those over low income households categories. A possible justification for this outcome would be the erosion of gross salaries and wages in real terms. In fact, other sources of income as property income present a larger weight in total income sources owned by these households' categories (See Table 9b in section 4). Lastly, in terms of how the change in the Tax wedge was distributed

within households' categories, our findings indicate that the PIT Reforms turned out to be quite regressive.

5.2. EFFECTS OF ALTERNATIVE FISCAL TAX REFORMS IN SPAIN AFTER 2010: ADVOCATING FOR SIMPLICITY.

Nowadays, many politicians and academics advocates for a simplification of the tax system in order to reduce financial costs both private (services paid to accountants and lawyers) and public (administration and enforcements costs) while potentially reducing tax evasion. There are many ways through which a tax system can be simplified. For the case of PIT, for instance, simplicity of the tax structure could be reached reducing the number of income brackets. Another possibility would be to introduce a flat tax system with deductions. Indirect taxes such as VAT could be eased through a single general tax rate, eliminating the semi-reduced and reduced ones. Those who vindicate a simpler tax system consider that it can even boost economic growth while detractors warn that this practice could make the system more regressive, deteriorating income equality levels.

In the present context of Spain, a pre-election period at a national level, all political parties especially the emerging ones, have presented their proposals in terms of Tax Reforms. Among them, the known as "Ciudadanos" has proposed the most fundamental reforms. These reforms consist on the following tax measures:

- Measure_1: To reduce to three the number of income brackets in the personal income taxation (applying the following tax rates: 18%, 28% and 42%, respectively). This proposal is complemented by including a bonus for the lowest incomes as well as a bonus for the retired people (pensions).
- Measure_2: To establish a single rate of 20% also applies to SMEs, eliminate practically all the tax benefits in income tax and strengthening the limits of deductibility of interest and
- Measure_3: To reduce from three to two the value-added taxes rates in the following way: a general tax rate fixed at 18% (as opposed to the current valued, 21%) and a reduced tax rate fixed at 7% (this reduces tax rate would include those good and services to which the current over-reduced tax rate is applied, fixed at 4%)

Clearly these reforms aim at increasing the simplicity of the structure of the tax system affecting both direct and indirect taxes. In this section we carried out an additional static comparative exercise trying to shed some light over the following question: What would have happened if these proposals (especially Measure_1 and Measure_3) would have replaced those applied by the actual government in power?. The way we have evaluated these two alternative measures, Measure_1 and Measure_3 is reported in Table 16 and 17 respectively.

Table 16. Measure_1.Initial and New Equilibrium VAT Tax Rates: Eliminating semi-reduced VAT Rates, 7% reduced Tax Rate and 18 % General Tax Rate.

	VAT-TAX RATE 2010		Alternative VAT REFORM		Evaluated Change in Tax Rates
Products' group Description	**Applied Tax Rates**	**Average Tax Rates**	**Applied Tax Rates**	**Average Tax Rates**	
Agriculture, Hunting, Forestry and Fishing Products	**4,7,8,16,18**	9,5	**7,18**	12,5	**0,3157**
Mining and Quarrying Products	**16,18**	17	**18**	18	**0,0588**
Food, Beverages and Tobacco Products	**4,7,8,16,18**	9,5	**7,18**	12,5	**0,3157**
Textile, Leather and Footwear Products	**16,18**	17	**18**	18	**0,0588**
Wood, Cork, Pulp, Paper Products, Printing and Publishing	**16,18**	17	**18**	18	**0,0588**
Coke, Refined Petroleum and Nuclear Fuel	**16,18**	17	**18**	18	**0,0588**
Chemical and Pharmaceutical Products	**4,7,8,16,18**	9,5	**7,18**	12,5	**0,3157**
Rubber and Plastic Products	**7,8,16,18**	12,25	**18**	18	**0,4693**
Other Non-Metallic Mineral Products	**16,18**	17	**18**	18	**0,0588**
Basic Metals and Fabricated Metal Products	**16,18**	17	**18**	18	**0,0588**
Metallic Products not including Machinery and Equipment	**16,18**	17	**18**	18	**0,0588**
Electrical and Optical Equipment	**16,18**	17	**18**	18	**0,0588**
Transport Equipment	**16,18**	17	**18**	18	**0,0588**
Motor Vehicles and Trailers	**16,18**	17	**18**	18	**0,0588**
Other Transport Equipment, Nec	**16,18**	17	**18**	18	**0,0588**
Furniture and other manufacturing products, nec	**16,18**	17	**18**	18	**0,0588**
Repair and Instalation activities	**16,18**	17	**18**	18	**0,0588**
Electricity and Gas	**7,8,16,18**	12,25	**18**	18	**0,4693**
Water Supply	**7,8**	7,5	**18**	18	**1,400**
Sewerage, Waste management and remediation services	**7,8**	7,5	**18**	18	**1,400**
Construction	**7,8,16,18**	12,25	**18**	18	**0,469**
Wholesale Trade and Retail Trade	**4,7,8,16,18**	9,5	**7,18**	12,5	**0,3157**
Transport Services and Storage Services	**7,8,16,18**	12,25	**7,18**	12,5	**0,0240**
Post Services	**Ex.16,18**	8,5	**Ex.18**	9	**0,0588**
Accommodation and Food Services	**7,8**	7,5	**18**	18	**1,400**
Publishing, motion picture, video and television programme production services	**4,16,18**	10,5	**7,18**	12,5	**0,190**
Other Information and Communication Services	**16,18**	17	**18**	18	**0,0588**
Financial and Insurance Services	**Ex.16,18**	8,5	**Ex.18**	9	**0,0588**
Real Estate Activities	**7,8,16,18**	12,25	**18**	18	**0,4693**
Professional,Scientific and Technical Services	**7,8,16,18**	12,25	**18**	18	**0,4693**
Renting of Machinery and Equipment	**16,18**	17	**18**	18	**0,0588**
Employment related Services	-	-	-		
Travel Agencies' activities and related activities	**Ex.7,8,16,18**	8,167	**Ex.18**	9	**0,1019**
Security, Research, Administrative and Business Activities	**16,18**	17	**18**	18	**0,0588**
Public Admin and Defence; Compulsory Social Security	-				
Education activities	**Ex.7,8,23**	10,167	**Ex.18/23**	13,66	**0,3435**
Health activities	**Ex.7,8**	3,75	**Ex.18**	9	**1,400**
Social Work activities	**Ex.7,8**	3,75	**Ex.18**	9	**1,400**
Other Community, Social and Personal Services	**7,8,16,18**	12,25	**18**	18	**0,469**

Table 17. Alternative Measure_3.Initial and New Equilibrium PIT				
Income bracket	**Sampling Taxable Income**	**Average PIT Rate 2010**	**Average PIT Alternative Policy**	**Evaluated Change in Average PIT Rates**
1	From Negative and zero to 3,000,00	**24,75**	**18,00**	**-0,2727**
2	From 3,000,01 to 6,000,00	**24,75**	**18,00**	**-0,2727**
3	From 6,000,01 to 12,000,00	**24,75**	**18,00**	**-0,2727**
4	From 12,000,01 to 18,000,00	**26,50**	**18,00**	**-0,2727**
5	From 18,000,01 to 30,000,00	**27,90**	**23,20**	**-0,1684**
6	From 30,000,01 to 60,000,00	**33,95**	**25,60**	**-0,2459**
7	From 60,000,01 to 120,000,00	**40,47**	**37,30**	**-0,0783**
8	From 120,000,01 to 240,000,00	**45,73**	**39,65**	**-0,1329**
9	From 240,000,00 onwards*	**47,71**	**40,43**	**-0,1525**

The macroeconomic and microeconomic impacts when introducing in our CGE model simultaneously the aforementioned alternative measures, Measure_1 and Measure 3 are presented in Table 18a and 18b. Compare to the results outlined in section 5.1 when evaluating actual tax reforms, it seems that these two alternative measures present similar outcomes in terms of the impact in economic growth i.e. the accumulated effect of actual tax reforms accounted for -0,585 points decrease in real GDP while alternative reforms erodes economic growth in -0,546 percentage points. Similar conclusions can be drawn in terms of public deficit. The main difference relies on their effect in the amount of direct and indirect tax revenues collected. Differently to our findings for actual tax reforms, the decline in PIT revenues is more pronounced while it is not the case for VAT revenues. In referring to the microeconomic impacts, the results obtained are 'quite disperse' in the sense that we cannot extract a clear conclusion about the degree of progressivity of two alternative measures: among low income households groups some experiment and decrease in both utility levels and fiscal pressure while for others we observe different outcomes. The same occurs for the case of middle and high income households categories.

Table 18a. Macroeconomic Impacts (Efficiency and Effectiveness) of Alternative Policies. Measure_1 (VAT Reform) and Measure_3 (PIT Reform)			
	Initial Equilibrium Values.	**Final Equilibrium Real Values*** **	**Evaluated Relative Impact in %**
Gross Domestic Production	**1.080.913**	**1.075.008**	**-0,546**
Average CPI	**1,000**	**1,022**	**2,20**
Unemployment Rate in %	**20,30**	**21,10**	
Private Savings	**251.858**	**252.069**	**0,083**
Public Savings	**-39.288**	**-40.465**	**2.99**
Public Deficit relative to GDP in %	**3,63**	**3,76**	
Deficit Balance of Payments	**41.979**	**40.783**	**-2.84**
Average Fiscal Wedge in %	**34,67**	**35,62**	
Revenues from Personal Income Taxes	**78.104**	**70.707**	**-9,47**
Demand GDP Components			
-Private Final Consumption	**607.981**	**609.086**	**0,181**
-Public Final Consumption	**232.489**	**231.083**	**-0,604**
-Gross Capital Formation	**254.549**	**246.578**	**-3,131**
-Exports	**275.847**	**275.711**	**-0,049**
-Imports	**289.953**	**287.452**	**-0,862**
Income GDP Components			
-Gross Wages and Salaries	**541.475**	**530.641**	**-2,000**
-Gross Operating Surplus/Mixed Income	**445.879**	**436.020**	**-2,211**
-Net Taxes on Imports and Products	**93.559**	**108.346**	**15,80**

******Evaluated Impacts in Real terms are computed as relative measures to the CPI under the new equilibrium.***

Table 18b. Microeconomic Impacts (Distributive effects) of Alternative Policies. Measure_1 (VAT Reform) and Measure_3 (PIT Reform)			
Income bracket	**Sampling Taxable Income**	**Relative Changes in Utility Levels**	**Changes in Fiscal Wedge**
1	From Negative and zero to 3,000,00	**-0,140**	**0,705**
2	From 3,000,01 to 6,000,00	**-0,060**	**2,290**
3	From 6,000,01 to 12,000,00	**0,211**	**0,298**
4	From 12,000,01 to 18,000,00	**-0,110**	**0,1530**
5	From 18,000,01 to 30,000,00	**-1,330**	**0,0523**
6	From 30,000,01 to 60,000,00	**-0,110**	**0,0216**
7	From 60,000,01 to 120,000,00	**0,679**	**0,0783**
8	From 120,000,01 to 240,000,00	**8,262**	**0,2930**
9	From 240,000,00 onwards	**-0,100**	**0,0635**

6. CONCLUSIONS, DISCUSSION AND FUTURE RESEARCH

Using a Microeconomic Spanish SAM for 2010 contracted by the authors that distinguish 9 households' categories according to their taxable income levels, we have carried out several static comparative exercises that aim at computing the total (direct, indirect and induced) impacts of both actual and alternative Tax Reforms. These impacts have been classified in three categories: effectiveness, efficiency and distributive effects.

One of the first fiscal policies undertaken since the right wing party was in power, consists on increasing VAT-rates in 2012 as an attempt to reduce the growing public deficit. Therefore, besides the potential negative impacts on growth and income distribution, the main objective of the Spanish government at that time was to favor fiscal consolidation.

Nevertheless, as Spain struggles to recover from the recession appeared in 2007, loud voices were calling for cuts in taxes to spur economic growth. In particular, advocates argue that cuts in PIT will promote growth and development. But what is the evidence for this idea? Objective scholarly research on the economic effects of taxes is often neglected or misrepresented by tax cut proponents. Empirical evidence suggests that adjustments in taxes can, at most, spark marginal gains in economic performance (Yu and Rickman, 2013). Therefore, there is no evidence that tax cuts pay for themselves by boosting future growth and tax collections. For public officials, there is no escape from carefully considering how various balances of taxes and spending affect both government budgets and surrounding economies. The truth is that certain kinds of tax reductions may have little effect on economic growth, even as they drain government coffers of revenues needed for crucial economic and social goals.

In fact, part of this statement has been proven through our analysis when evaluating actual and alternative tax reforms in the context of the Spanish economy. When 'replicating' the VAT-Reform undertaken by the Spanish government in 2012 in our CGE model, our results indicate a good performance of the policy in terms of effectiveness i.e. reducing public deficit. However, as 'predicted' by economic theory, the increase in indirect taxation generate welfare losses that were unequally distributed among households' categories: poorer households experimented larger welfare losses and an increase in their fiscal pressure approximated in our analysis by the tax wedge. Later on, when the path of economic recovery started (at the end of 2013), the Spanish government announced the implementation of a PIT Reform that would be undertaken in two phases (PIT Reforms packages). This PIT Reform was presented by the Spanish government as a measure that seek to boost economic growth while alleviating the income distribution deterioration that follows the economic crisis along with the increases in VAT rates. The outcomes obtained in our approach when sequential introducing of these PIT Reforms after evaluating the VAT-Reform of 2012, indicates that the policy has little contribution to recover both income equality distribution levels and economic growth.

In addition, we have also evaluated some of the alternative policies proposed by emerging parties such as "Ciudadanos" that mainly advocate for a Simpler Tax System in the Spanish economy. Our findings show that 'simplicity' does not necessary lead to a better performance of the Tax Reforms in terms of effectiveness and efficiency. Related to the distributive effects (microeconomic effects), instead, the results extracted from our analysis do not allow us to obtain a clear conclusion about their outcome.

All these conclusions, though in line with economic theory, must be taken with caution. In our approach and especially in evaluating PIT reforms, we do not have controlled for those changes that affect neither deductions nor taxation of savings. This is fact is quite important and could affect remarkably the results and more specifically those related to the distributive impacts. Future research will address these limitations.

REFERENCES:

Ahmed, A.U and Y.Shams. 1994. Demand Elasticities in Rural Bangladesh: An Application of the AIDS Model. Bangladesh Development Studies, Vol. 22, pp. 1-25.

Álvarez-Martínez, M.A and Polo, C. 2014.A new Social Accounting Matrix for Spain with investment disaggregated by capital goods. Estadística Española, Vol 56, pp. 5-37.

Álvarez-Martínez, M.A and C. Polo. 2014. A General Equilibrium Evaluation of Tax Policies in Spain during the Great Recession. Revista de Economía Aplicada, No. 65, pp. 99-116.

Armagan, G. and Akbay, C. 2008. An Econometric Analysis of Urban Household's Animal Products Consumption in Turkey. Applied Economics, Vol 40, pp. 2029-2036.

Armington, P. 1969. A Theory of Demand for Products Distinguished by Place of Production. IMF Staff Papers, 16 (1). pp. 159-178.

Bajo, O., I. Rabadan and R. Salas. 1999. Regional wage flexibility in Spain, 1989–1992. Instituto de Estudios Fiscales del Ministerio de Hacienda. Working paper.

BBVA-Ivie Institute. 2014. Crecimiento y Competitividad: Los Desafíos de un Desarrollo Inteligente.Pérez-García, F.(Dir).

Blanchflower, D.G. and A.J. Oswald.1994.The Wage Curve. MIT Press, Cambridge, MA.

Blanchflower, D.G. and A.J. Oswald. 2005. The Wage Curve Reloaded. NBER Working Papers Series, Nº 11338.

Canziani, P. 1997. The wage curve in Italy and Spain. Are European wages flexible?, Centre for Economic Performance, Discussion Paper Nº 375.

Cingano, F. 2014. Trends in Income Inequality and its Impact on Economic Growth. OECD Social, Employment and Migration Working Papers, No. 163, OECD.

Conesa, J.C. et al. 2010. La subida del Impuesto Sobre el Valor Añadido en España: Demasiado cara y demasiado pronto. (FEDEA). Documento de trabajo 2010-06.

Collado, J.C. and F. Sancho. 2002. Recovering Hidden Indirect Tax Rates for Improved Calibration in Multisectoral Modelling. Economic Systems Research, 14, pp.81-88.

De La Roca, J. 2014. Wage cyclicality: Evidence from Spain using social security Data. Journal of the Spanish Economic Association 5(2), pp. 173–195.

Dewatripont, M. and G. Michel.1987. On Closure Rules, Homogeneity and Dynamics in Applied General Equilibrium Models. Journal of Development Economics, 26 (1), pp. 65-76.

Eurostat (2008) Eurostat Manual of Supply, Use and Input-Output Tables (Luxembourg: Eurostat.

Font, P; Izquierdo, M and S. Puente. 2015. Real Wage Responsiveness to Unemployment in Spain: Asymmetries along the Business Cycle. Documentos de Trabajo del Banco de España. Nº 1504.

Garcia-Mainar, I. and V. Montuenga-Gomez .2003.The Spanish wage curve: 1994-1996. Regional Studies, 37 (9), pp. 929-45

General Department of Taxation of the Spanish Government, 2012. Annual Statistical Report of the Value-Added Tax 2010 for Spain.

OECD. 2011. An Overview of Growing Income Inequalities in OECD countries: Main Findings. Available at: https://www.oecd.org/els/soc/49499779.pdf

OECD. 2013. Crisis Squeezes Income and Put Pressure on Inequality and Poverty. Available at: http://www.oecd.org/els/soc/OECD2013-Inequality-and-Poverty-8p.pdf

Goerlich Gisbert, F.J. and A. Villar Notario. 2009. Desigualdad y Bienestar Social: de la Teoría a la Práctica. Economía y Sociedad. Ed. Fundación BBVA.

Hernández de Cos, P. y López Rodríguez, D. 2014. Estructura impositiva y capacidad recaudatoria en España: un análisis comparado con la UE. (Banco de España. Documento Ocasional N. º 1406.).

Houthakker, H.S. and Taylor, L.D. 1970. Consumer demand in United States, 1929-1990. Harvard University Press, Cambridge.

Jansen, K.P. and T. ten Raa, T. 1990. The Choice of Model in the Construction of Input-Output Coefficients Matrices. International Economic Review, 31, pp. 213-227

Jimeno, J., and S. Bentolila. 1998. Regional unemployment persistence in Spain: 1976–1994. Labour Economics, 5, pp. 25–51.

Kehoe, T.J., Noyola, P.J., Manresa, A., Polo, C. and F. Sancho. 1988. A General Equilibrium Analysis of the 1986 Tax Reform in Spain. European Economic Review, 32(2-3), pp. 334-342.

Lucena, A. and M. Serrano .2006. Building a social accounting matrix within the ESA-95 framework: Obtaining a dataset for applied general equilibrium modeling. Working Paper. 168. Universitat de Barcelona.

Manresa, A. and F. Sancho. 2005. Implementing a Double Dividend: Recycling Ecotaxes towards Lower Labor Taxes. Energy Policy, 33(12), pp. 1577-1585.

Oswald, A.J. 1982. A Microeconomic Theory of the Trade Union. The Economic Journal, 92, pp. 576-595.

Pyatt, G. 1988. A SAM Approach to Modelling. Journal of Policy Modelling. Vol 10, pp. 327-352.

Ruiz-Huerta Carbonell, J. y García Díaz, M.Á. 2012. El endeudamiento de las Comunidades Autónomas: Límites y problemas en el contexto de la crisis económica.

Sancho, F. 2010. Double Dividend Effectiveness of Energy Tax Policies and the Elasticity of Substitution: A CGE Appraisal. Energy Policy, 38 (6), pp. 2927-2933.

Sanromá, E and R. Ramos. 2005. Further Evidence on Disaggregated Wage Curves: The Case of Spain. Australian Journal of Labour Economics, 8(3) pp.227-243.

Shoven, J.B. and J. Whalley. 1972. A general equilibrium calculation of the effects of differential taxation of income from capital in the US". Journal of Public Economics, 1(3-4), pp.281-321.

Shoven, J.B. and J. Whalley. 1984. Applied General-Equilibrium Models of Taxation and International Trade: An Introduction and Survey.Journal of Economic Literature, Vol. 22,pp. 1007-1051.

Stone, R. and A. Brown.1962. A Computable Model for Economic Growth. Cambridge, UK: Cambridge Growth Project.

WTO. 2016.World Trade Organization Statistical Database on Trade and Tariffs. Available at: https://www.wto.org/english/tratop_e/tariffs_e/tariff_data_e.htm